

# HP 5120 EI Switch Series

High Availability

Command Reference

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# Ethernet OAM configuration commands

## display oam

### Syntax

```
display oam { local | remote } [ interface interface-type interface-number ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

2: System level

### Parameters

**local**: Displays local Ethernet OAM connection information.

**remote**: Displays remote Ethernet OAM connection information.

**interface** *interface-type interface-number*: Specifies a port by its type and number.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display oam** to display information about an Ethernet OAM connection, including connection status, information contained in the Ethernet OAM packet header, and Ethernet OAM packet statistics.

If no interface is specified, this command displays information about all Ethernet OAM connections.

Related commands: **reset oam**.

### Examples

```
# Display information about the Ethernet OAM connection established on the local port GigabitEthernet 1/0/1.
```

```
<Sysname> display oam local interface gigabitethernet 1/0/1
Port          : GigabitEthernet1/0/1
Link Status   : Up
EnableStatus  : Enable
Local_oam_mode : Active          Local_pdu          : ANY
Local_mux_action : FWD          Local_par_action : FWD
```

```
OAMLocalFlagsField :
```

```
-----
Link Fault          : 0          Dying Gasp          : 0
```

```
Critical Event          : 0          Local Evaluating      : COMPLETE
Remote Evaluating      : COMPLETE
```

Packets statistic :

```
Packets                Send                Receive
-----
OAMPDU                 645                648
OAMInformation         645                648
OAMEventNotification  0                  --
OAMUniqueEventNotification --                0
OAMDuplicateEventNotification --                0
```

**Table 1 Command output**

Field	Description
Port	Port index.
Link Status	Link status (up or down).
EnableStatus	Ethernet OAM state (enabled or disabled).
Local_oam_mode	Local Ethernet OAM mode: <ul style="list-style-type: none"> <li>• <b>Active</b>—The port is operating in active Ethernet OAM mode.</li> <li>• <b>Passive</b>—The port is operating in passive Ethernet OAM mode.</li> </ul>
Local_pdu	The way in which the local end processes Ethernet OAMPDUs: <ul style="list-style-type: none"> <li>• <b>RX_INFO</b>—The port only receives Information OAMPDUs and does not send any Ethernet OAMPDUs.</li> <li>• <b>LF_INFO</b>—The port only sends the Information OAMPDUs without Information TLV triplets and with their link error flag bits being set.</li> <li>• <b>INFO</b>—The port sends and receives only Information OAMPDUs.</li> <li>• <b>ANY</b>—The port sends and receives Ethernet OAMPDUs of any type.</li> </ul>
Local_mux_action	Working mode of the local transmitter: <ul style="list-style-type: none"> <li>• <b>FWD</b>—The port can send any packets.</li> <li>• <b>DISCARD</b>—The port only sends Ethernet OAMPDUs.</li> </ul>
Local_par_action	Working mode of the local receiver: <ul style="list-style-type: none"> <li>• <b>FWD</b>—The port can receive any packets.</li> <li>• <b>DISCARD</b>—The port only receives Ethernet OAMPDUs.</li> <li>• <b>LB</b>—The local receiver is in loopback state. All the packets other than Ethernet OAMPDUs received on the local receiver are returned to their sources along the ways they came.</li> </ul>
OAMLocalFlagsField	Local flags inserted in the local flag fields of the Ethernet OAMPDUs sent.
Link Fault	Indicates whether an Ethernet OAM link error is present: 0 for no and 1 for yes.
Dying Gasp	Indicates whether a fatal error is present: 0 for no and 1 for yes.
Critical Event	Indicates whether a critical error is present: 0 for no and 1 for yes.
Local Evaluating	Indicates whether the local-to-remote configuration negotiation is complete: <ul style="list-style-type: none"> <li>• <b>COMPLETE</b>—The negotiation is completed.</li> <li>• <b>NOTCOMPLETE</b>—The negotiation is uncompleted.</li> </ul>

Field	Description
Remote Evaluating	Indicates whether the remote-to-local configuration negotiation is complete: <ul style="list-style-type: none"> <li>• <b>COMPLETE</b>—The negotiation is completed.</li> <li>• <b>NOTCOMPLETE</b>—The negotiation is uncompleted.</li> <li>• <b>RESERVED</b>—The field is reserved and the negotiation is uncompleted.</li> <li>• <b>UNSATISFIED</b>—The peer end is not satisfied with the local configuration and the negotiation is uncompleted.</li> </ul>
Packets statistic	Statistics for Ethernet OAMPDUs sent and received.
OAMPDU	Total number of the Ethernet OAMPDUs sent and received.
OAMInformation	Number of Information OAMPDUs sent and received.
OAMEventNotification	Number of Event notification OAMPDUs sent and received.
OAMUniqueEventNotification	Number of unduplicated Event notification OAMPDUs sent or received.
OAMDuplicateEventNotification	Number of duplicate Event notification OAMPDUs sent or received.

# Display the Ethernet OAM information for the peer port GigabitEthernet 1/0/1.

```
<Sysname> display oam remote interface gigabitethernet 1/0/1
```

```
Port          : GigabitEthernet1/0/1
```

```
Link Status   : Up
```

```
Information of the latest received OAM packet:
```

```
OAMRemoteMACAddress      : 00e0-fd73-6502
```

```
OAMRemotePDUConfiguration : 1500
```

```
OAMRemoteState :
```

```
-----
Remote_mux_action      : FWD          Remote_par_action     : FWD
```

```
OAMRemoteConfiguration :
```

```
-----
OAM Mode               : Active      Unidirectional Support : YES
```

```
Loopback Support       : NO          Link Events             : YES
```

```
Variable Retrieval     : NO
```

```
OAMRemoteFlagsField :
```

```
-----
Link Fault              : 0          Dying Gasp              : 0
```

```
Critical Event         : 0          Local Evaluating        : COMPLETE
```

```
Remote Evaluating      : COMPLETE
```

**Table 2 Command output**

Field	Description
Port	Port index.
Link Status	Link status.

Field	Description
Information of the latest received OAM packet	Information about the latest received Ethernet OAMPDU.
OAMRemoteMACAddress	MAC address of the Ethernet OAM peer.
OAMRemotePDUConfiguration	Maximum Ethernet OAMPDU size allowed.
OAMRemoteState	State of the Ethernet OAM peer.
Remote_mux_action	Peer sending mode. For more information, see <a href="#">Table 1</a> .
Remote_par_action	Peer receiving mode. For more information, see <a href="#">Table 1</a> .
OAMRemoteConfiguration	Configuration of the peer Ethernet OAM entity.
OAM Mode	Ethernet OAM mode.
Unidirectional Support	Indicates whether unidirectional transmission is supported (YES or NO).
Loopback Support	Indicates whether Ethernet OAM remote loopback is supported (YES or NO).
Link Events	Indicates whether Ethernet OAM link error events are supported (YES or NO).
Variable Retrieval	Indicates whether MIB variable retrieval is supported (YES or NO).
OAMRemoteFlagsField	Values of the peer Ethernet OAM flag fields in OAM packets.
Link Fault	Indicates whether a link fault is present: 0 for no and 1 for yes.
Dying Gasp	Indicate whether a fatal fault is present: 0 for no and 1 for yes.
Critical Event	Indicate whether a critical fault is present: 0 for no and 1 for yes.
Local Evaluating	Indicates whether the local-to-remote configuration negotiation is complete: <ul style="list-style-type: none"> <li>• <b>COMPLETE</b>—The negotiation is completed.</li> <li>• <b>NOTCOMPLETE</b>—The negotiation is uncompleted.</li> <li>• <b>RESERVED</b>—The field is reserved and the negotiation is uncompleted.</li> <li>• <b>UNSATISFIED</b>—The peer end is not satisfied with the local configuration and the negotiation is uncompleted.</li> </ul>
Remote Evaluating	Indicates whether the remote-to-local configuration negotiation is complete: <ul style="list-style-type: none"> <li>• <b>COMPLETE</b>—The negotiation is completed.</li> <li>• <b>NOTCOMPLETE</b>—The negotiation is uncompleted.</li> </ul>

## display oam configuration

### Syntax

```
display oam configuration [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

2: System level

## Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display oam configuration** to display global Ethernet OAM configuration, including the periods and thresholds for Ethernet OAM link error event detection.

Related commands: **oam errored-symbol period**, **oam errored-symbol threshold**, **oam errored-frame period**, **oam errored-frame threshold**, **oam errored-frame-period period**, **oam errored-frame-period threshold**, **oam errored-frame-seconds period**, **oam errored-frame-seconds threshold**, **oam timer hello**, and **oam timer keepalive**.

## Examples

```
# Display global Ethernet OAM configuration.
```

```
<Sysname> display oam configuration
```

```
Configuration of the link event window/threshold :
```

```
-----  
Errored-symbol Event period(in seconds)      :      1  
Errored-symbol Event threshold                :      1  
Errored-frame Event period(in seconds)        :      1  
Errored-frame Event threshold                 :      1  
Errored-frame-period Event period(in ms)      :    1000  
Errored-frame-period Event threshold          :      1  
Errored-frame-seconds Event period(in seconds):     60  
Errored-frame-seconds Event threshold        :      1
```

```
Configuration of the timer :
```

```
-----  
Hello timer(in ms)                           :    1000  
Keepalive timer(in ms)                       :    5000
```

**Table 3 Command output**

Field	Description
Configuration of the link event window/threshold	Detection intervals and triggering thresholds configured for link events.
Errored-symbol Event period (in seconds)	Errored symbol event detection interval, which defaults to one second.
Errored-symbol Event threshold	Errored symbol event triggering threshold, which defaults to 1.
Errored-frame Event period (in seconds)	Errored frame event detection interval, which defaults to one second.
Errored-frame Event threshold	Errored frame event triggering threshold, which defaults to 1.

Field	Description
Errored-frame-period Event period (in ms)	Errored frame period event detection interval, which defaults to 1000 milliseconds.
Errored-frame-period Event threshold	Errored frame period event triggering threshold, which defaults to 1.
Errored-frame-seconds Event period (in seconds)	Errored frame seconds event detection interval, which defaults to 60 seconds.
Errored-frame-seconds Event threshold	Errored frame seconds event triggering threshold, which defaults to 1.
Configuration of the timer	Ethernet OAM connection detection timers.
Hello timer(in ms)	Ethernet OAM handshake packet transmission interval, the value of which defaults to 1000 milliseconds.
Keepalive timer(in ms)	Ethernet OAM connection timeout timer, the value of which defaults to 5000 milliseconds.

## display oam critical-event

### Syntax

```
display oam critical-event [ interface interface-type interface-number ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

2: System level

### Parameters

**interface** *interface-type interface-number*: Specifies a port by its type and number.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display oam critical-event** to display the statistics on critical Ethernet OAM link that have events occurred on a port.

If no port is specified, this command displays critical Ethernet OAM link event statistics for all ports.

### Examples

```
# Display critical Ethernet OAM link event statistics for all ports.
```

```
<Sysname> display oam critical-event
Port          : GigabitEthernet1/0/1
Link Status   : Up
```

Event statistic :

-----  
Link Fault :0 Dying Gasp : 0 Critical Event : 0

**Table 4 Command output**

Field	Description
Port	Port index.
Link Status	Link status.
Event statistic	Critical Ethernet OAM link event statistics.
Link Fault	Indicates whether a link fault is present: 0 for no and 1 for yes.
Dying Gasp	Indicates whether a fatal fault is present: 0 for no and 1 for yes.
Critical Event	Indicates whether a critical fault is present: 0 for no and 1 for yes.

## display oam link-event

### Syntax

```
display oam link-event { local | remote } [ interface interface-type interface-number ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

2: System level

### Parameters

**local**: Displays local Ethernet OAM link error event statistics.

**remote**: Displays peer Ethernet OAM link error event statistics.

**interface** *interface-type interface-number*: Specifies a port by its type and number.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display oam link-event** to display statistics for Ethernet OAM link error events that occurred on a local port or a peer port. Ethernet OAM link error events include errored symbol events, errored frame events, errored frame period events, and errored frame seconds events.

If no port is specified, this command displays local or remote Ethernet OAM link error event statistics for all ports.

Related commands: **display oam configuration** and **reset oam**.

## Examples

```
# Display local Ethernet OAM link error event statistics for all ports.
```

```
<Sysname> display oam link-event local
```

```
Port          : GigabitEthernet1/0/1
```

```
Link Status   : Up
```

```
OAMLocalErrFrameEvent : (ms = milliseconds)
```

```
-----  
Event Time Stamp          : 3539          Errored Frame Window : 10(100ms)
```

```
Errored Frame Threshold  : 5            Errored Frame         : 1488111
```

```
Error Running Total      : 260908758   Event Running Total   : 307
```

```
OAMLocalErrFramePeriodEvent :
```

```
-----  
Event Time Stamp          : 3539          Errored Frame Window : 976500
```

```
Errored Frame Threshold  : 1            Errored Frame         : 1042054
```

```
Error Running Total      : 260909151   Event Running Total   : 471
```

```
OAMLocalErrFrameSecsSummaryEvent : (ms = milliseconds)
```

```
-----  
Event Time Stamp : 3389
```

```
Errored Frame Second Summary Window : 600(100ms)
```

```
Errored Frame Second Summary Threshold : 1
```

```
Errored Frame Second Summary : 60
```

```
Error Running Total : 292          Event Running Total : 5
```

**Table 5 Command output**

Field	Description
Port	Port index.
Link Status	Link status.
OAMLocalErrFrameEvent	Information about local errored frame events: <ul style="list-style-type: none"><li>• <b>Event Time Stamp</b>—Time when an errored frame event occurred (in 100 milliseconds).</li><li>• <b>Errored Frame Window</b>—Errored frame detection interval (in 100 milliseconds).</li><li>• <b>Errored Frame Threshold</b>—Errored threshold that triggers an errored frame event.</li><li>• <b>Errored Frame</b>—Number of detected errored frames in the most recent errored frame event.</li><li>• <b>Error Running Total</b>—Total number of errored frames.</li><li>• <b>Event Running Total</b>—Total number of errored frame events that have occurred.</li></ul>

Field	Description
OAMLocalErrFramePeriodEvent	<p>Information about local errored frame period events:</p> <ul style="list-style-type: none"> <li>• <b>Event Time Stamp</b>—Time when an errored frame event occurred (in 100 milliseconds).</li> <li>• <b>Errored Frame Window</b>—Maximum number of 64-byte frames that can be transmitted through an Ethernet port over the configured errored frame period detection interval. For more information, see the "<a href="#">oam errored-frame-period period</a>" command.</li> <li>• <b>Errored Frame Threshold</b>—Errored threshold that triggers an errored frame period event.</li> <li>• <b>Errored Frame</b>—Number of detected errored frames in the most recent errored frame period event.</li> <li>• <b>Error Running Total</b>—Total number of errored frames that have detected.</li> <li>• <b>Event Running Total</b>—Total number of errored frame period events.</li> </ul>
OAMLocalErrFrameSecsSummaryEvent	<p>Information about local errored frame seconds events:</p> <ul style="list-style-type: none"> <li>• <b>Event Time Stamp</b>—Time when an errored frame seconds event occurred (in terms of 100 milliseconds).</li> <li>• <b>Errored Frame Second Summary Window</b>—Errored frame second detection interval (in 100 milliseconds).</li> <li>• <b>Errored Frame Second Summary Threshold</b>—Errored threshold that triggers an errored frame seconds event.</li> <li>• <b>Errored Frame Second Summary</b>—Number of detected errored frame seconds in the most recent errored frame seconds event.</li> <li>• <b>Error Running Total</b>—Total number of errored frame seconds.</li> <li>• <b>Event Running Total</b>—Total number of errored frame seconds events that have occurred.</li> </ul>

# Display remote Ethernet OAM link event statistics for all ports.

```
<Sysname> display oam link-event remote
Port :GigabitEthernet1/0/1
Link Status :Up
OAMRemoteErrFrameEvent : (ms = milliseconds)
-----
Event Time Stamp          : 5789          Errored Frame Window    : 10(100ms)
Errored Frame Threshold   : 1           Errored Frame           : 3
Error Running Total       : 35          Event Running Total     : 17
```

**Table 6 Command output**

Field	Description
Port	Port index.
Link Status	Link status.
OAMLocalErrFrameEvent	<p>Information about remote errored frame events:</p> <ul style="list-style-type: none"> <li>• <b>Event Time Stamp</b>—Time when an errored frame event occurred (in 100 milliseconds).</li> <li>• <b>Errored Frame Window</b>—Errored frame detection interval (in 100 milliseconds).</li> <li>• <b>Errored Frame Threshold</b>—Errored threshold that triggers an errored frame event.</li> <li>• <b>Errored Frame</b>—Number of detected errored frames in the most recent errored frame event.</li> <li>• <b>Error Running Total</b>—Total number of errored frames.</li> <li>• <b>Event Running Total</b>—Total number of errored frame events that have occurred.</li> </ul>

# oam enable

## Syntax

**oam enable**  
**undo oam enable**

## View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

None

## Description

Use **oam enable** to enable Ethernet OAM on the Ethernet port.  
Use **undo oam enable** to disable Ethernet OAM on the Ethernet port.  
By default, Ethernet OAM is disabled on all Ethernet ports.

## Examples

```
# Enable OAM on port GigabitEthernet 1/0/1.  
<Sysname> system-view  
[Sysname] interface gigabitethernet 1/0/1  
[Sysname-GigabitEthernet1/0/1] oam enable
```

# oam errored-frame period

## Syntax

**oam errored-frame period** *period-value*  
**undo oam errored-frame period**

## View

System view

## Default level

2: System level

## Parameters

*period-value*: Errored frame event detection interval, ranging from 1 to 60 (in seconds).

## Description

Use **oam errored-frame period** to set the errored frame event detection interval.  
Use **undo oam errored-frame period** to restore the default.  
By default, the errored frame event detection interval is one second.  
Related commands: **oam errored-frame threshold**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame event detection interval to 10 seconds.
<Sysname> system-view
[Sysname] oam errored-frame period 10
```

# oam errored-frame threshold

## Syntax

```
oam errored-frame threshold threshold-value
undo oam errored-frame threshold
```

## View

System view

## Default level

2: System level

## Parameters

*threshold-value*: Errored frame event triggering threshold, ranging from 0 to 4294967295.

## Description

Use **oam errored-frame threshold** to set the errored frame event triggering threshold.

Use **undo oam errored-frame threshold** to restore the default.

By default, the errored frame event triggering threshold is 1.

Related commands: **oam errored-frame period**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame event triggering threshold to 100.
<Sysname> system-view
[Sysname] oam errored-frame threshold 100
```

# oam errored-frame-period period

## Syntax

```
oam errored-frame-period period period-value
undo oam errored-frame-period period
```

## View

System view

## Default level

2: System level

## Parameters

*period-value*: Errored frame period event detection interval, ranging from 100 to 60000 (in milliseconds).

## Description

Use **oam errored-frame-period period** to set the errored frame period event detection interval.

Use **undo oam errored-frame-period period** to restore the default.

By default, the errored frame period event detection interval is 1000 milliseconds.

For errored frame period event detection, the system first uses the following expression to convert the errored frame period event detection interval to the maximum number of 64-byte frames that can be transmitted through an Ethernet port in the period:

$$\text{bandwidth} * \text{period} / (64 * 8 * 1000),$$

where **bandwidth** is the port bandwidth (in bps) and "period" is the configured period (in milliseconds).

Related commands: **oam errored-frame-period threshold**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame period event detection interval to 10 seconds (10000 milliseconds).
<Sysname> system-view
[Sysname] oam errored-frame-period period 10000
```

## oam errored-frame-period threshold

### Syntax

```
oam errored-frame-period threshold threshold-value
undo oam errored-frame-period threshold
```

### View

System view

### Default level

2: System level

### Parameters

*threshold-value*: Errored frame period event triggering threshold, ranging from 0 to 4294967295.

### Description

Use **oam errored-frame-period threshold** to set the errored frame period event triggering threshold.

Use **undo oam errored-frame-period threshold** to restore the default.

By default, the errored frame period event triggering threshold is 1.

Related commands: **oam errored-frame-period period**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame period event triggering threshold to 100.
<Sysname> system-view
[Sysname] oam errored-frame-period threshold 100
```

## oam errored-frame-seconds period

### Syntax

```
oam errored-frame-seconds period period-value
undo oam errored-frame-seconds period
```

## View

System view

## Default level

2: System level

## Parameters

*period-value*: Errored frame seconds event detection interval, ranging from 10 to 900 (in seconds).

## Description

Use **oam errored-frame-seconds period** to set the errored frame seconds event detection interval.

Use **undo oam errored-frame-seconds period** to restore the default.

By default, the errored frame seconds event detection interval is 60 seconds.

Related commands: **oam errored-frame-seconds threshold**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame seconds event detection interval to 100 seconds.
<Sysname> system-view
[Sysname] oam errored-frame-seconds period 100
```

# oam errored-frame-seconds threshold

## Syntax

```
oam errored-frame-seconds threshold threshold-value
undo oam errored-frame-seconds threshold
```

## View

System view

## Default level

2: System level

## Parameters

*threshold-value*: Errored frame seconds event triggering threshold, ranging from 0 to 900.

## Description

Use **oam errored-frame-seconds threshold** to set the errored frame seconds event triggering threshold.

Use **undo oam errored-frame-seconds threshold** to restore the default.

By default, the errored frame seconds event triggering threshold is 1.

Related commands: **oam errored-frame-seconds period**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored frame seconds event triggering threshold to 100.
<Sysname> system-view
[Sysname] oam errored-frame-seconds threshold 100
```

# oam errored-symbol period

## Syntax

```
oam errored-symbol period period-value  
undo oam errored-symbol period
```

## View

System view

## Default level

2: System level

## Parameters

*period-value*: Errored symbol event detection interval, ranging from 1 to 60 (in seconds).

## Description

Use **oam errored-symbol period** to set the errored symbol event detection interval.

Use **undo oam errored-symbol period** to restore the default.

By default, the errored symbol event detection interval is one second.

Related commands: **oam errored-symbol threshold**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored symbol event detection interval to 10 seconds.  
<Sysname> system-view  
[Sysname] oam errored-symbol period 10
```

# oam errored-symbol threshold

## Syntax

```
oam errored-symbol threshold threshold-value  
undo oam errored-symbol threshold
```

## View

System view

## Default level

2: System level

## Parameters

*threshold-value*: Errored symbol event triggering threshold, ranging from 0 to 4,294,967,295.

## Description

Use **oam errored-symbol threshold** to set the errored symbol event triggering threshold.

Use **undo oam errored-symbol threshold** to restore the default.

By default, the errored symbol event triggering threshold is 1.

Related commands: **oam errored-symbol period**, **display oam link-event**, and **display oam configuration**.

## Examples

```
# Set the errored symbol event triggering threshold to 100.
<Sysname> system-view
[Sysname] oam errored-symbol threshold 100
```

# oam loopback

## Syntax

**oam loopback**

**undo oam loopback**

## View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

None

## Description

Use **oam loopback** to enable Ethernet OAM remote loopback on the specified Ethernet port.

Use **undo oam loopback** to disable Ethernet OAM remote loopback on the Ethernet port.

By default, Ethernet OAM remote loopback is disabled on the Ethernet port.

Ethernet OAM remote loopback is available only after the Ethernet OAM connection is established and can be performed only by the Ethernet OAM entities operating in active Ethernet OAM mode.

Related commands: **oam enable**, **oam loopback interface**, and **oam mode**.

## Examples

```
# Configure the active Ethernet OAM mode and enable Ethernet OAM on GigabitEthernet 1/0/1, and
then enable Ethernet OAM remote loopback on GigabitEthernet 1/0/1 in Layer 2 Ethernet interface
view.
```

```
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] oam mode active
[Sysname-GigabitEthernet1/0/1] oam enable
[Sysname-GigabitEthernet1/0/1] oam loopback
```

# oam loopback interface

## Syntax

**oam loopback interface** *interface-type interface-number*

**undo oam loopback interface** *interface-type interface-number*

## View

User view, system view

## Default level

2: System level (command in system view)

1: Monitor level (command in user view)

## Parameters

*interface-type interface-number*: Specifies a port by its type and number.

## Description

Use **oam loopback interface** to enable Ethernet OAM remote loopback on an Ethernet port.

Use **undo oam loopback interface** to disable Ethernet OAM remote loopback on an Ethernet port.

By default, Ethernet OAM remote loopback is disabled on an Ethernet port.

Ethernet OAM remote loopback is available only after the Ethernet OAM connection is established and can be performed only by the Ethernet OAM entities operating in active Ethernet OAM mode.

Related commands: **oam enable**, **oam loopback**, and **oam mode**.

## Examples

# Configure the active Ethernet OAM mode and enable Ethernet OAM on GigabitEthernet 1/0/1, and then enable Ethernet OAM remote loopback on GigabitEthernet 1/0/1 in system view.

```
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] oam mode active
[Sysname-GigabitEthernet1/0/1] oam enable
[Sysname-GigabitEthernet1/0/1] quit
[Sysname]oam loopback interface gigabitethernet 1/0/1
```

# oam loopback reject-request

## Syntax

**oam loopback reject-request**

**undo oam loopback reject-request**

## View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

None

## Description

Use **oam loopback reject-request** to configure a port to reject the Ethernet OAM remote loopback request from a remote port.

Use **undo oam loopback reject-request** to restore the default.

By default, a port does not reject the Ethernet OAM remote loopback request from a remote port.

## Examples

```
# Configure GigabitEthernet 1/0/1 to reject the Ethernet OAM remote loopback request from a remote port.
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] oam loopback reject-request
```

## oam mode

### Syntax

```
oam mode { active | passive }
undo oam mode
```

### View

Layer 2 Ethernet interface view

### Default level

2: System level

### Parameters

**active**: Specifies the active Ethernet OAM mode.

**passive**: Specifies the passive Ethernet OAM mode.

### Description

Use **oam mode** to set the Ethernet OAM mode for an Ethernet port.

Use **undo oam mode** to restore the default.

By default, an Ethernet OAM-enabled Ethernet port operates in the active Ethernet OAM mode.

To change the Ethernet OAM mode of an Ethernet OAM-enabled Ethernet port, you need to disable Ethernet OAM on the port first.

Related commands: **oam enable**.

## Examples

```
# Disable Ethernet OAM on GigabitEthernet 1/0/1, and then configure GigabitEthernet 1/0/1 to operate in passive Ethernet OAM mode.
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] undo oam enable
[Sysname-GigabitEthernet1/0/1] oam mode passive
```

## oam timer hello

### Syntax

```
oam timer hello interval
undo oam timer hello
```

### View

System view

## Default level

2: System level

## Parameters

*interval*: Ethernet OAM handshake packet transmission interval, in milliseconds. The value of this argument must be a multiple of 100 and range from 500 to 5000. .

## Description

Use **oam timer hello** to configure the Ethernet OAM handshake packet transmission interval.

Use **undo oam timer hello** to restore the default.

By default, the Ethernet OAM handshake packet transmission interval is 1000 milliseconds.

After the timeout timer for an Ethernet OAM connection expires, the local OAM entity ages out its connection with the peer OAM entity, causing the OAM connection to be disconnected. HP recommends setting the connection timeout timer at least five times the handshake packet transmission interval, ensuring the stability of Ethernet OAM connections.

Related commands: **oam timer keepalive** and **display oam configuration**.

## Examples

# Set the Ethernet OAM handshake packet transmission interval to 600 milliseconds—assume that the Ethernet OAM connection timeout timer is 5000 milliseconds.

```
<Sysname> system-view  
[Sysname] oam timer hello 600
```

# oam timer keepalive

## Syntax

**oam timer keepalive** *interval*

**undo oam timer keepalive**

## View

System view

## Default level

2: System level

## Parameters

*interval*: Ethernet OAM connection timeout timer, in milliseconds. The value of this argument must be a multiple of 100 and range from 1000 to 25000.

## Description

Use **oam timer keepalive** to configure the Ethernet OAM connection timeout timer.

Use **undo oam timer keepalive** to restore the default.

By default, the Ethernet OAM connection timeout timer is 5000 milliseconds.

After the timeout timer for an Ethernet OAM connection expires, the local OAM entity ages out its connection with the peer OAM entity, causing the OAM connection to be disconnected. HP recommends setting the connection timeout timer at least five times the handshake packet transmission interval, ensuring the stability of Ethernet OAM connections.

Related commands: **oam timer hello** and **display oam configuration**.

## Examples

# Set the Ethernet OAM connection timeout timer to 6000 milliseconds—assume that the Ethernet OAM handshake packet transmission interval is 1000 milliseconds.

```
<Sysname> system-view  
[Sysname] oam timer keepalive 6000
```

## reset oam

### Syntax

```
reset oam [ interface interface-type interface-number ]
```

### View

User view

### Default level

2: System level

### Parameters

**interface** *interface-type interface-number*: Specifies a port by its type and number.

### Description

Use **reset oam** to clear the Ethernet OAM packet and link error event statistics for the specified port or all ports.

If no port is specified, this command clears the Ethernet OAM packet and link error event statistics for all ports.

Related commands: **display oam** and **display oam link-event**.

### Examples

# Clear Ethernet OAM packet and link error event statistics for all ports.

```
<Sysname> reset oam
```

---

# CFD configuration commands

## cfid ais enable

### Syntax

```
cfid ais enable  
undo cfid ais enable
```

### View

System view

### Default level

2: System level

### Parameters

None

### Description

Use **cfid ais enable** to enable AIS.

Use **undo cfid ais enable** to disable AIS.

By default, AIS is disabled.

### Examples

```
# Enable AIS.  
<Sysname> system-view  
[Sysname] cfid ais enable
```

## cfid ais level

### Syntax

```
cfid ais level level-value service-instance instance-id  
undo cfid ais level level-value service-instance instance-id
```

### View

System view

### Default level

2: System level

### Parameters

**level** *level-value*: Specifies the AIS frame transmission level, which ranges from 1 to 7.

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

### Description

Use **cfid ais level** to configure the AIS frame transmission level in the specified service instance.

Use **undo cfid ais level** to restore the default.

By default, no AIS frame transmission level is configured for a service instance.

If no AIS frame transmission level is configured for a service instance, the MEPs in the service instance cannot send AIS frames.

Regardless of the value of the *level-value* argument, the **undo cfd ais level** command restores the AIS frame transmission level to an invalid value.

## Examples

```
# Configure the AIS frame transmission level as 3 in service instance 1.
<Sysname> system-view
[Sysname] cfd ais level 3 service-instance 1
```

## cfd ais period

### Syntax

```
cfd ais period period-value service-instance instance-id
undo cfd ais period period-value service-instance instance-id
```

### View

System view

### Default level

2: System level

### Parameters

**period** *period-value*: Specifies the AIS frame transmission period, which ranges from 1 to 60 seconds.

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

### Description

Use **cfd ais period** to configure the AIS frame transmission period in the specified service instance.

Use **undo cfd ais period** to restore the default.

By default, the AIS frame transmission period is 1 second in all service instances.

Regardless of the value of the *period-value* argument, the **undo cfd ais period** command restores the AIS frame transmission period to 1 second.

## Examples

```
# Configure the AIS frame transmission period as 60 seconds in service instance 1.
<Sysname> system-view
[Sysname] cfd ais period 60 service-instance 1
```

## cfd cc enable

### Syntax

```
cfd cc service-instance instance-id mep mep-id enable
undo cfd cc service-instance instance-id mep mep-id enable
```

### View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**mep** *mep-id*: Specifies the ID of a MEP, ranging from 1 to 8191.

## Description

Use **cfld cc enable** to enable CCM sending on a specified MEP.

Use **undo cfld cc enable** to disable CCM sending on a specified MEP.

By default, the CCM sending function is disabled.

Related commands: **cfld cc interval**.

## Examples

```
# On port GigabitEthernet 1/0/1, enable CCM sending on MEP 3 in service instance 5.
```

```
<Sysname> system-view
```

```
[Sysname] interface gigabitethernet 1/0/1
```

```
[Sysname-GigabitEthernet1/0/1] cfld cc service-instance 5 mep 3 enable
```

# cfld cc interval

## Syntax

**cfld cc interval** *interval-value* **service-instance** *instance-id*

**undo cfld cc interval** **service-instance** *instance-id*

## View

System view

## Default level

2: System level

## Parameters

**interval** *interval-value*: Specifies the value of the interval field in CCM messages, which ranges from 4 to 7.

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

## Description

Use **cfld cc interval** to set the value of the interval field in the CCM messages.

Use **undo cfld cc interval** to restore default.

By default, the value of this field is 4 for all CCMs sent.

The relationship between the interval field value in the CCM messages, the interval for sending CCM messages, and the timeout time of the remote MEP is shown in [Table 7](#).

**Table 7 Relationship of interval field value, interval for sending CCMs, and timeout time of remote MEP**

Interval field value	Interval for sending CCMs	Timeout time of remote MEP
4	1 second	3.5 seconds

Interval field value	Interval for sending CCMs	Timeout time of remote MEP
5	10 seconds	35 seconds
6	60 seconds	210 seconds
7	600 seconds	2100 seconds

Related commands: **cf**d cc enable.

## Examples

```
# Set the value of the interval field in CCMs sent by MEPs in service instance 2 to 7.
<Sysname> system-view
[Sysname] cfd cc interval 7 service-instance 2
```

## cf dm one-way

### Syntax

```
cf dm one-way service-instance instance-id mep mep-id { target-mac mac-address | target-mep target-mep-id } [ number number ]
```

### View

System view

### Default level

2: System level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the source MEP by its ID, which ranges from 1 to 8191.

**target-mac** *mac-address*: Specifies the target MEP by its MAC address, in the format of H-H-H.

**target-mep** *target-mep-id*: Specifies the target MEP by its ID, which ranges from 1 to 8191.

**number** *number*: Specifies the number of 1DM frames sent. The *number* argument ranges from 2 to 10, and defaults to 5.

### Description

Use **cf dm one-way** to enable one-way DM. The one-way DM function measures the one-way frame delay between two MEPs by sending 1DM frames from the source MEP to the target MEP.

By default, one-way DM is disabled.

The one-way DM function takes effect only in CFD IEEE 802.1ag.

To view the one-way delay test result, use the **display cf dm one-way history** command on the target MEP.

Related commands: **cf version** and **display cf dm one-way history**.

## Examples

```
# Enable the one-way DM function in CFD IEEE 802.1ag to test the one-way frame delay from source
MEP 1101 to target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1.
<Sysname> system-view
[Sysname] cfd version standard
```

```
[Sysname] cfd dm one-way service-instance 1 mep 1101 target-mep 2001
Info: 5 1DMs have been sent. Please check the result on the remote device.
```

## cfd dm two-way

### Syntax

```
cfd dm two-way service-instance instance-id mep mep-id { target-mac mac-address | target-mep target-mep-id } [ number number ]
```

### View

System view

### Default level

2: System level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the source MEP by its ID, which ranges from 1 to 8191.

**target-mac** *mac-address*: Specifies the target MEP by its MAC address, in the format of H-H-H.

**target-mep** *target-mep-id*: Specifies the target MEP by its ID, which ranges from 1 to 8191.

**number** *number*: Specifies the number of DMM frames sent. The *number* argument ranges from 2 to 10, and defaults to 5.

### Description

Use **cfd dm two-way** to enable two-way DM. The two-way DM function measures the two-way frame delay between two MEPs by sending DMM frames from the source MEP to the target MEP and detecting the responded DMR frames.

By default, two-way DM is disabled.

The two-way DM function takes effect only in CFD IEEE 802.1ag.

Related commands: **cfd version**.

### Examples

```
# Enable the two-way DM function in CFD IEEE 802.1ag to test the two-way frame delay between source MEP 1101 and target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1.
```

```
<Sysname> system-view
[Sysname] cfd version standard
[Sysname] cfd dm two-way service-instance 1 mep 1101 target-mep 2001
Frame delay:
Reply from 0010-FC00-6512: 10ms
Reply from 0010-FC00-6512: 9ms
Reply from 0010-FC00-6512: 11ms
Reply from 0010-FC00-6512: 5ms
Reply from 0010-FC00-6512: 5ms
Average: 8ms
Send DMMs: 5          Received: 5          Lost: 0

Frame delay variation: 5ms  4ms  6ms  0ms  0ms
Average: 3ms
```

**Table 8 Command output**

Field	Description
Reply from 0010-FC00-6512	Delay of the DMR frames returned from the MEP with MAC address 0010-FC00-6512
Average	Average frame delay or average frame delay variation
Send DMMs	Number of DMM frames sent
Received	Number of DMM frames received
Lost	Number of DMM frames lost

## cfid enable

### Syntax

```
cfid enable  
undo cfid enable
```

### View

System view

### Default level

2: System level

### Parameters

None

### Description

Use **cfid enable** to enable CFD.

Use **undo cfid enable** to disable CFD.

By default, CFD is disabled.

### Examples

```
# Enable CFD.  
<Sysname> system-view  
[Sysname] cfid enable
```

## cfid linktrace

### Syntax

```
cfid linktrace service-instance instance-id mep mep-id { target-mep target-mep-id | target-mac mac-address } [ tll tll-value ] [ hw-only ]
```

### View

Any view

### Default level

0: Visit level

## Parameters

- service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.
- mep** *mep-id*: Specifies the ID of the source MEP, ranging from 1 to 8191.
- target-map** *target-mep-id*: Specifies the ID of the destination MEP, ranging from 1 to 8191.
- target-mac** *mac-address*: Specifies the MAC address of the destination MP, in the format of H-H-H.
- tll** *tll-value*: Specifies the time to live value, ranging from 1 to 255 and defaulting to 64.
- hw-only**: Sets the hw-only bits of the LTM's sent. When this keyword is specified and the MIP that receives LTM's cannot find the destination MAC address in its forwarding table, the MIP does not broadcast these LTM messages. Otherwise, the MIP forwards these LTM messages.

## Description

Use **cfld linktrace** to find the path between the source MEP and target MP, which is achieved through the transmission of LTM's between the two and detection of the responding LTR's.

Related commands: **cfld linktrace auto-detection**.

## Examples

```
# Identify the path between source MEP 1101 and target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1 when the standard version (IEEE 802.1ag) of CFD is used.
```

```
<Sysname> system-view
[Sysname] cfd version standard
[Sysname] cfd linktrace service-instance 1 mep 1101 target-mep 2001
Linktrace to MEP 2001 with the sequence number 1101-43361
MAC Address          TTL      Last MAC          Relay Action
0010-FC00-6512      63      0010-FC00-6500   Hit
```

```
# Identify the path between source MEP 1101 and target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1 when the IEEE 802.1ag draft 5.2 version of CFD is used.
```

```
<Sysname> system-view
[Sysname] cfd version draft5
[Sysname] cfd linktrace service-instance 1 mep 1101 target-mep 2001
Linktrace to MEP 2001 with the sequence number 1101-43361 :
MAC Address          TTL      Forwarded         Relay Action
0010-FC00-6512      63      No                None
```

```
# Identify the path between source MEP 1101 and target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1 when the IEEE 802.1ag draft 5.2 interim version of CFD is used.
```

```
<Sysname> system-view
[Sysname] cfd version draft5-plus
[Sysname] cfd linktrace service-instance 1 mep 1101 target-mep 2001
Linktrace to MEP 2001 with the sequence number 1101-43361 :
MAC Address          TTL      Forwarded         Relay Action
0010-FC00-6512      63      No                None
```

---

### NOTE:

The output varies by CFD protocol version.

---

**Table 9 Command output**

Field	Description
Linktrace to MEP 2001 with the sequence number 1101-43361	Linktrace to target MEP 2001 with the sequence number 1101-43361.
MAC Address	Source MAC address in the LTR messages.
TTL	Hop count when the LTM passes the device.
Last MAC	MAC address of the last-hop device the LTM passes.
Forwarded	Indicates whether the device forwards LTMs: <ul style="list-style-type: none"> <li>• Yes means that the current device forwards LTMs.</li> <li>• No means that the current device does not forward LTMs.</li> </ul>
Relay Action	Indicates whether the forwarding device found the destination MAC address in its MAC address table. When the standard version (IEEE 802.1ag) of CFD is used: <ul style="list-style-type: none"> <li>• <b>Hit</b>—The current device is the destination device.</li> <li>• <b>FDB</b>—The forwarding device found the destination MAC address.</li> <li>• <b>MPDB</b>—The destination MAC address is not found, or that the destination MAC address is found in the MEP or MIP database.</li> </ul> When the IEEE 802.1ag draft5.2 version or the IEEE 802.1ag draft 5.2 interim version of CFD is used: <ul style="list-style-type: none"> <li>• <b>Found</b>—The forwarding device found the destination MAC address.</li> <li>• <b>Unknown</b>—The forwarding device failed to find the destination MAC address.</li> <li>• <b>None</b>—It is a MEP that responded to the LTM message. A MEP does not need to find the destination MAC address.</li> </ul>

## cfld linktrace auto-detection

### Syntax

**cfld linktrace auto-detection** [ **size** *size-value* ]

**undo cfld linktrace auto-detection**

### View

System view

### Default level

2: System level

### Parameters

**size** *size-value*: Specifies the size of the buffer used to store the auto-detection result, ranging from 1 to 100 (in terms of sending times).

This value defaults to 5, which means the buffer stores the results of the recent five auto-detections.

### Description

Use **cfld linktrace auto-detection** to enable the auto sending of linktrace messages.

Use **undo cfld linktrace auto-detection** to disable this function.

By default, this function is disabled.

After LT messages automatic sending is enabled, if the source MEP fails to receive the CCMs from the target MEP within 3.5 times the sending interval, the link between the two is regarded as faulty and LTMes will be sent out. (The destination of the LTMes is the target MEP, and the TTL field value is 255.) Based on the LTRs that echo back, the fault source can be located.

Once you disable LT messages automatic sending, the content stored in the buffer will be removed.

Related commands: **cfld linktrace**.

## Examples

```
# Enable automatic LT messages sending, and specify the size of the buffer used to store the auto-detection result to 100 (in terms of sending times).
```

```
<Sysname> system-view
```

```
[Sysname] cfld linktrace auto-detection size 100
```

## cfld loopback

### Syntax

```
cfld loopback service-instance instance-id mep mep-id { target-mep target-mep-id | target-mac mac-address } [ number number ]
```

### View

Any view

### Default level

0: Visit level

### Parameters

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**mep** *mep-id*: Specifies the ID of a source MEP, ranging from 1 to 8191.

**target-mep** *target-mep-id*: Specifies the ID of the target MEP, ranging from 1 to 8191.

**target-mac** *mac-address*: Specifies the MAC address of the target MP, in the format of H-H-H.

**number** *number*: Specifies the number of the LBMes packets sent, ranging from 1 to 10 and defaulting to 5.

### Description

Use **cfld loopback** to enable LB function so that LBMes can be sent from the specified MEP to other MPes in the same service instance, and LBR messages can be received.

By default, LB is not enabled.

## Examples

```
# Enable LB to check the status of the link between MEP 1101 and MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1 (assume that the link status is normal).
```

```
<Sysname> cfld loopback service-instance 1 mep 1101 target-mep 2001
```

```
Loopback to 0010-FC00-6512 with the sequence number start from 1101-43404:
```

```
Reply from 0010-FC00-6512: sequence number=1101-43404 time=5ms
```

```
Reply from 0010-FC00-6512: sequence number=1101-43405 time=5ms
```

```
Reply from 0010-FC00-6512: sequence number=1101-43406 time=5ms
```

```
Reply from 0010-FC00-6512: sequence number=1101-43407 time=5ms
```

```
Reply from 0010-FC00-6512: sequence number=1101-43408 time=5ms
```

```
Send:5          Received:5          Lost:0
```

# Enable LB to check the status of the link between MEP 1101 and MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1 (assume that the link status is abnormal).

```
<Sysname> cfd loopback service-instance 1 mep 1101 target-mep 2001
```

```
Sequence number=1101-43404: Request timed out
```

```
Sequence number=1101-43405: Request timed out
```

```
Sequence number=1101-43406: Request timed out
```

```
Sequence number=1101-43407: Request timed out
```

```
Sequence number=1101-43408: Request timed out
```

```
Send:5          Received:0          Lost:5
```

**Table 10 Command output**

Field	Description
Loopback to 0010-FC00-6512 with the sequence number start from 1101-43404	Sends LBMs to 0010-FC00-6512 with the sequence number starting with 1101-43404.
sequence number	Sequence number in the LBR messages.
time=5ms	The interval between the sending of LBMs and receiving of LBRs is 5 milliseconds.
Request timed out	The request is timed out because no LBR is received within 5 milliseconds.
Send	Number of LBMs sent.
Received	Number of LBR messages received.
Lost	Number of lost LBRs.

## cfd ma

### Syntax

```
cfd ma ma-name md md-name vlan vlan-id
```

```
undo cfd ma ma-name md md-name
```

### View

System view

### Default level

2: System level

### Parameters

**ma** *ma-name*: Specifies the name of the MA, a string of 1 to 43 characters. IEEE 802.1ag standard version allows an MA name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MA name to contain letters, numbers, and special characters (including – and \_), but do not allow an MA name to start or end with a special character.

**md** *md-name*: Specifies the name of an MD, a string of 1 to 43 characters. IEEE 802.1ag standard version allows an MD name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim

version allow an MD name to contain letters, numbers, and special characters (including – and \_), but do not allow an MD name to start or end with a special character.

**vlan** *vlan-id*: Specifies the ID of the VLAN where MA is in service, ranging from 1 to 4094.

## Description

Use **cfg ma** to create MAs in an MD.

Use **undo cfg ma** to delete MAs in an MD.

By default, no MA is created.

Before creating an MA, you must create an MD first.

The total length of the MA and MD names should not exceed 44 characters.

Deleting an MA also deletes the configurations related to that MA.

Related commands: **cfg md**.

## Examples

```
# Create an MA named test_ma in an MD named test_md, and configure the MA to serve VLAN 100.
```

```
<Sysname> system-view  
[Sysname] cfg md test_md level 3  
[Sysname] cfg ma test_ma md test_md vlan 100
```

## cfg md

### Syntax

**cfg md** *md-name* **level** *level-value*

**undo cfg md** *md-name*

### View

System view

### Default level

2: System level

### Parameters

**md** *md-name*: Specifies the name of an MD, a string of 1 to 43 characters. IEEE 802.1ag standard version allows an MD name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MD name to contain letters, numbers, and special characters (including – and \_), but do not allow an MD name to start or end with a special character.

**level** *level-value*: Specifies an MD level, ranging from 0 to 7.

## Description

Use **cfg md** to create an MD.

Use **undo cfg md** to delete an MD.

By default, no MD is created.

You can create only one MD with a specific level. MD cannot be created if you enter an invalid MD name or an existing MD name.

Deleting an MD also deletes the configurations related to that MD.

## Examples

```
# Create an MD named test_md, with its level being 3.
<Sysname> system-view
[Sysname] cfd md test_md level 3
```

## cfd mep

### Syntax

```
cfd mep mep-id service-instance instance-id { inbound | outbound }
undo cfd mep mep-id service-instance instance-id
```

### View

Layer 2 Ethernet interface view

### Default level

2: System level

### Parameters

**mep** *mep-id*: Specifies the ID of a MEP, ranging from 1 to 8191.

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**inbound**: Creates an inward-facing MEP.

**outbound**: Creates an outward-facing MEP.

### Description

Use **cfd mep** to create a MEP.

Use **undo cfd mep** to delete the specified MEP.

By default, no MEP exists on a port.

In creating a MEP, the service instance you specified defines the MD and MA that the MEP belongs to.

You cannot create a MEP if the MEP ID is not included in the MEP list of the relevant service instance.

Related commands: **cfd meplist**.

## Examples

```
# Configure a MEP list in service instance 5, and create and enable inward-facing MEP 3 in service
instance 5 on GigabitEthernet 1/0/1.
<Sysname> system-view
[Sysname] cfd md test_md level 3
[Sysname] cfd ma test_ma md test_md vlan 100
[Sysname] cfd service-instance 5 md test_md ma test_ma
[Sysname] cfd meplist 3 service-instance 5
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] cfd mep 3 service-instance 5 inbound
```

## cfd mep enable

### Syntax

```
cfd mep service-instance instance-id mep mep-id enable
```

**undo cfd mep service-instance** *instance-id* **mep** *mep-id* **enable**

## View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**mep** *mep-id*: Specifies the ID of a MEP, ranging from 1 to 8191.

## Description

Use **cfd mep enable** to enable the MEP configured on a port.

Use **undo cfd mep enable** to disable the MEP.

By default, MEP is disabled on a port and cannot respond to various CFD frames (such as LTM frames, LBM frames, 1DM frames, DMM frames, and TST frames) unless you enable it.

Related commands: **cfd mep**.

## Examples

```
# Enable MEP 3 in service instance 5 on GigabitEthernet 1/0/1.
```

```
<Sysname> system-view
```

```
[Sysname] interface gigabitethernet 1/0/1
```

```
[Sysname-GigabitEthernet1/0/1] cfd mep service-instance 5 mep 3 enable
```

# cfd meplist

## Syntax

**cfd meplist** *mep-list* **service-instance** *instance-id*

**undo cfd meplist** *mep-list* **service-instance** *instance-id*

## View

System view

## Default level

2: System level

## Parameters

**meplist** *mep-list*: Specifies a list of MEP IDs. The *mep-list* argument takes the form of { *mep-id* [ **to** *mep-id* ] }&<1-10>, where *mep-id* represents the MEP ID and ranges from 1 to 8191. &<1-10> indicates you can specify up to 10 MEP ID ranges.

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

## Description

Use **cfd meplist** to create a MEP list, which is a collection of local MEPs allowed to be configured and the remote MEPs to be monitored in the same MA.

Use **undo cfd meplist** to delete existing MEP lists.

By default, no MEP list is created.

Before creating a MEP list, create the relevant MD, MA, and service instance.

After you delete a MEP list, all local MEP configurations based on this list are deleted.

Related commands: **cfm ma**, **cfm md**, and **cfm service-instance**.

## Examples

```
# Create a MEP list that includes MEP 9 through MEP 15 in service instance 5.
<Sysname> system-view
[Sysname] cfm md test_md level 3
[Sysname] cfm ma test_ma md test_md vlan 100
[Sysname] cfm service-instance 5 md test_md ma test_ma
[Sysname] cfm meplist 9 to 15 service-instance 5
```

## cfm mip-rule

### Syntax

```
cfm mip-rule { default | explicit } service-instance instance-id
undo cfm mip-rule service-instance instance-id
```

### View

System view

### Default level

2: System level

### Parameters

**default**: This rule means that if the lower level MA is not configured with MIPs, the current MA will create MIPs.

**explicit**: This rule means that if the lower level MA is not configured with MIPs, whether the current MA will create MIPs depends on whether the lower level MA is configured with MEPs.

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

### Description

Use **cfm mip-rule** to configure the rules for generating MIPs. MIPs are generated on each port automatically according to the rules configured.

Use **undo cfm mip-rule** to delete the rule for generating MIPs.

By default, no rules for generating MIPs are configured and no MIPs exist.

### Examples

```
# Configure the MIP generation rule as default in service instance 5.
<Sysname> system-view
[Sysname] cfm mip-rule default service-instance 5
```

## cfm service-instance

### Syntax

```
cfm service-instance instance-id md md-name ma ma-name
undo cfm service-instance instance-id
```

## View

System view

## Default level

2: System level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**md** *md-name*: Specifies the name of an MD. The *md-name* argument is a string of 1 to 43 characters. IEEE 802.1ag standard version allows an MD name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MD name to contain letters, numbers, and special characters (including – and \_), but do not allow an MD name to start or end with a special character.

**ma** *ma-name*: Specifies the name of an MA. The *ma-name* argument is a string of 1 to 43 characters. IEEE 802.1ag standard version allows an MA name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MA name to contain letters, numbers, and special characters (including – and \_), but do not allow an MA name to start or end with a special character.

## Description

Use **cfg service-instance** to create a service instance with the MD name.

Use **undo cfg service-instance** to delete a service instance.

By default, no service instance is created.

You must create the relevant MD and MA prior to creating a service instance with the MD name.

The service instance ID uniquely identifies an MA in an MD.

When deleting a service instance, you are deleting the configurations related to that service instance as well.

Deleting a service instance simply breaks up the connection between the service instance and the relevant MA, the MA itself is not deleted.

A service instance with the MD name takes effect in all versions of CFD.

Related commands: **cfg md**, **cfg ma**, and **cfg version**.

## Examples

# Create a level-3 MD named **test\_md**, create an MA named **test\_ma**, which serves VLAN 100, in **test\_md**, and then create service instance 5 with the MD name for **test\_md** and **test\_ma**.

```
<Sysname> system-view
[Sysname] cfg md test_md level 3
[Sysname] cfg ma test_ma md test_md vlan 100
[Sysname] cfg service-instance 5 md test_md ma test_ma
```

## cfg service-instance maid format

### Syntax

**cfg service-instance** *instance-id* **maid format** { **icc-based** *ma-name* | **string** *ma-name* } **level** *level-value*  
**vlan** *vlan-id*

**undo cfg service-instance** *instance-id*

## View

System view

## Default level

2: System level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**icc-based** *ma-name*: Specifies an ITU Carrier Codes (ICC)-based MA name. The *ma-name* argument is a string of 1 to 13 characters. IEEE 802.1ag standard version allows an MA name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MA name to contain letters, numbers, and special characters (including – and \_), but do not allow an MA name to start or end with a special character.

**string** *ma-name*: Specifies a string as the MA name. The *ma-name* argument is a string of 1 to 45 characters. IEEE 802.1ag standard version allows an MA name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MA name to contain letters, numbers, and special characters (including – and \_), but do not allow an MA name to start or end with a special character.

**level** *level-value*: Specifies the MD level for the service instance, which ranges from 0 to 7.

**vlan** *vlan-id*: Specifies the VLAN for the service instance. The *vlan-id* argument ranges from 1 to 4094.

## Description

Use **cmd service-instance maid format** to create a service instance without the MD name.

Use **undo cmd service-instance** to remove the specified service instance.

By default, no service instance is created.

When you create a service instance without the MD name, the system automatically creates the MA and MD for the service instance.

The service instance ID, MA name, and MD level uniquely identify a MA.

Deleting a service instance also deletes all configurations based on the service instance.

Deleting a service instance removes not only the service instance ID-MA association, but also the MA.

A MD with no MAs will be deleted.

A service instance without the MD name takes effect only in the IEEE 802.1ag standard version of CFD.

Related commands: **cmd version**.

## Examples

```
# Create service instance 5 without the MD name in CFD IEEE 802.1ag, and configure the ICC-based MA name test_ma1, MD level 3, and VLAN 100 for the service instance.
```

```
<Sysname> system-view
```

```
[Sysname] cfd version standard
```

```
[Sysname] cfd service-instance 5 maid format icc-based test_ma1 level 3 vlan 100
```

```
# Create service instance 6 without the MD name in CFD IEEE 802.1ag, and configure the MA named test_ma2, MD level 4, and VLAN 200 for the service instance.
```

```
<Sysname> system-view
```

```
[Sysname] cfd version standard
```

```
[Sysname] cfd service-instance 6 maid format string test_ma2 level 4 vlan 200
```

## cfm slm

### Syntax

```
cfm slm service-instance instance-id mep mep-id { target-mac mac-address | target-mep target-mep-id }  
[ number number ]
```

### View

System view

### Default level

2: System level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the source MEP by its ID, which ranges from 1 to 8191.

**target-mac** *mac-address*: Specifies the target MEP by its MAC address, in the format of H-H-H.

**target-mep** *target-mep-id*: Specifies the target MEP by its ID, which ranges from 1 to 8191.

**number** *number*: Specifies the number of LMM frames sent. The *number* argument ranges from 2 to 10, and defaults to 5.

### Description

Use **cfm slm** to enable LM. The LM function measures the frame loss between two MEPs by sending LMM frames from the source MEP to the target MEP and detecting the returned LMR frames.

By default, LM is disabled.

The LM function takes effect only in CFM IEEE 802.1ag.

Related commands: **cfm version**.

### Examples

```
# Enable the LM function in CFM IEEE 802.1ag to measure the frame loss between source MEP 1101 and  
target MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1.
```

```
<Sysname> system-view  
[Sysname] cfm version standard  
[Sysname] cfm slm service-instance 1 mep 1101 target-mep 2001  
Reply from 0010-FC00-6512  
Far-end frame loss: 10    Near-end frame loss: 20  
Reply from 0010-FC00-6512  
Far-end frame loss: 40    Near-end frame loss: 40  
Reply from 0010-FC00-6512  
Far-end frame loss: 0     Near-end frame loss: 10  
Reply from 0010-FC00-6512  
Far-end frame loss: 30    Near-end frame loss: 30  
  
Average  
Far-end frame loss: 20    Near-end frame loss: 25  
Far-end frame loss rate: 25%    Near-end frame loss rate: 32%  
Send LMMs: 5            Received: 5            Lost: 0
```

**Table 11 Command output**

Field	Description
Reply from 0010-FC00-6512	LMR frames returned from the target MEP with MAC address 0010-FC00-6512
Far-end frame loss	Number of lost frames on the target MEP
Near-end frame loss	Number of lost frames on the source MEP
Far-end frame loss rate	Average frame loss ratio on the target MEP
Near-end frame loss rate	Average frame loss ratio on the source MEP
Average	Average number of lost frames
Send LMMs	Number of LMM frames sent
Received	Number of LMR frames received
Lost	Number of LMR frames lost

## cfdd tst

### Syntax

```
cfdd tst service-instance instance-id mep mep-id { target-mac mac-address | target-mep target-mep-id }
[ number number ] [ length-of-test length ] [ pattern-of-test { all-zero | prbs } [ with-crc ] ]
```

### View

System view

### Default level

2: System level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the source MEP by its ID, which ranges from 1 to 8191.

**target-mac** *mac-address*: Specifies the target MEP by its MAC address, in the format of H-H-H.

**target-mep** *target-mep-id*: Specifies the target MEP by its ID, which ranges from 1 to 8191.

**number** *number*: Specifies the number of TST frames sent. The *number* argument ranges from 1 to 10, and defaults to 5.

**length-of-test** *length*: Specifies the length of the Test TLV (Type/Length/Value) in the TST frame. The *length* argument ranges from 4 to 1400 and defaults to 64.

**pattern-of-test** { **all-zero** | **prbs** } [ **with-crc** ]: Specifies the pattern of the Test TLV in the TST frame, which can be **all-zero** (all-zero value without CRC-32), **prbs** (pseudo random bit sequence without CRC-32), **all-zero with-crc** (all-zero value with CRC-32), and **prbs with-crc** (pseudo random bit sequence with CRC-32). The default mode is **all-zero**.

### Description

Use **cfdd tst** to enable the TST function. The TST function detects the bit errors between two MEPs by sending TST frames from the source MEP to the target MEP.

By default, the TST function is disabled.

The TST function takes effect only in CFD IEEE 802.1ag.

To view the TST test result, use the **display cfd tst** command on the target MEP.

Related commands: **cfd version** and **display cfd tst**.

## Examples

```
# Enable the TST function in CFD IEEE 802.1ag to test the bit errors between source MEP 1101 and destination MEP 2001 (whose MAC address is 0010-FC00-6512) in service instance 1.
```

```
<Sysname> system-view
[Sysname] cfd version standard
[Sysname] cfd tst service-instance 1 mep 1101 target-mep 2001
Info: TST process is done. Please check the result on the remote device.
```

**Table 12 Command output**

Field	Description
TST process is done	The TST test has been performed

## cfd version

### Syntax

```
cfd version { draft5 | draft5-plus | standard }
```

```
undo cfd version
```

### View

System view

### Default level

2: System level

### Parameters

**draft5**: Specifies that IEEE 802.1ag draft5.2 be used.

**draft5-plus**: Specifies that the IEEE 802.1ag draft5.2 interim version be used.

**standard**: Specifies that the standard version of IEEE 802.1ag be used.

### Description

Use **cfd version** to configure the CFD protocol version.

Use **undo cfd version** to restore the default.

By default, CFD uses the standard version of IEEE 802.1ag.

If an MD is created by using the **cfd md** command or automatically generated by using the **cfd service-instance maid format** command on a device, you cannot switch between the standard and non-standard versions (draft5.2 version and draft5.2 interim version), however, you can switch between the draft5.2 version and draft5.2 interim version. This restriction does not apply to the device without an MD configured.

Related commands: **cfd md** and **cfd service-instance maid format**.

### Examples

```
# Configure the CFD protocol version as IEEE 802.1ag draft5.2.
```

```
<Sysname> system-view
[Sysname] cfd version draft5
```

## display cfd ais

### Syntax

```
display cfd ais [ service-instance instance-id [ mep mep-id ] ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the MEP by its ID, which ranges from 1 to 8191.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd ais** to display the AIS configuration and information on the specified MEP.

If no MEP is specified, the **display cfd ais** command displays the AIS configuration and information of all MEPs in the specified service instance.

If no service instance is specified, the **display cfd ais** command displays the AIS configuration and information of all MEPs in all service instances.

Related commands: **cfd ais enable**, **cfd ais level**, and **cfd ais period**.

### Examples

```
# Display the AIS configuration and information of all the MEPs in all service instances.
```

```
<Sysname> display cfd ais
Service instance: 5
AIS level: 4    AIS period: 1s
MEP ID: 1
AIS condition: yes    Time to enter the condition: 2013/05/22 10:43:57
AIS state machine:  Prestate: NO_RECEIVE
                   Curstate: RECEIVE
MEP ID: 2
AIS condition: yes    Time to enter the condition: 2013/05/22 10:43:57
AIS state machine:  Prestate: NO_RECEIVE
                   Curstate: RECEIVE
```

```

Service instance: 20
AIS level: 3    AIS period: 60s
MEP ID: 10
AIS condition: yes    Time to enter the condition: 2013/05/22 10:43:57
AIS state machine: Prestate: NO_RECEIVE
                  Curstate: RECEIVE

```

```

Service instance: 100
AIS level: 6    AIS period: 1s
MEP ID: 20
AIS condition: no    Time to enter the condition: 2013/05/22 11:40:01
AIS state machine: Prestate: IDLE
                  Curstate: NO_RECEIVE

```

**Table 13 Command output**

Field	Description
Service instance	Service instance of the MEP.
AIS level	AIS frame transmission level.
AIS period	AIS frame transmission period.
AIS condition	AIS status: <ul style="list-style-type: none"> <li>• <b>yes</b>—AIS is running.</li> <li>• <b>no</b>—AIS is not running.</li> </ul>
Time to enter the condition	Time when the AIS status began.
AIS state machine	AIS packet receiving state machine.
Prestate	Previous state: <ul style="list-style-type: none"> <li>• <b>IDLE</b>—Not activated.</li> <li>• <b>NO_RECEIVE</b>—Activated.</li> <li>• <b>RECEIVE</b>—AIS frames are received.</li> </ul>
Curstate	Current state: <ul style="list-style-type: none"> <li>• <b>IDLE</b>—Not activated.</li> <li>• <b>NO_RECEIVE</b>—Activated.</li> <li>• <b>RECEIVE</b>—AIS frames are received.</li> </ul>

## display cfd dm one-way history

### Syntax

```

display cfd dm one-way history [ service-instance instance-id [ mep mep-id ] ] [ | { begin | exclude | include } regular-expression ]

```

### View

Any view

### Default level

1: Monitor level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the MEP by its ID, which ranges from 1 to 8191.

**|**: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd dm one-way history** to display the one-way DM result on the specified MEP.

If no MEP is specified, the **display cfd dm one-way history** command displays the one-way DM results of all MEPs in the specified service instance.

If no service instance is specified, the **display cfd dm one-way history** command displays the one-way DM results of all MEPs in all service instances.

Related commands: **cfd dm one-way**.

## Examples

```
# Display the one-way DM results of all the MEPs in all service instances.
```

```
<Sysname> display cfd dm one-way history
```

```
Service instance: 1
```

```
MEP ID: 1003
```

```
Send 1DM total number: 0
```

```
Received 1DM total number: 5
```

```
Frame delay: 10ms 9ms 11ms 5ms 5ms
```

```
Delay average: 8ms
```

```
Frame delay variation:5ms 4ms 6ms 0ms 0ms
```

```
Variation average: 3ms
```

```
MEP ID: 1004
```

```
Send 1DM total number: 0
```

```
Received 1DM total number: 5
```

```
Frame delay: 10ms 9ms 11ms 5ms 5ms
```

```
Delay average: 8ms
```

```
Delay variation: 5ms 4ms 6ms 0ms 0ms
```

```
Variation average: 3ms
```

```
Service instance: 2
```

```
No mep exists in the service instance.
```

```
Service instance: 3
```

```
MEP ID: 1023
```

```
Send 1DM total number: 5
```

```
Received 1DM total number: 10
```

```
Frame delay: 20ms 9ms 8ms 7ms 1ms 5ms 13ms 17ms 9ms 10ms
```

```
Delay average: 9ms
```

```
Delay variation: 19ms 8ms 7ms 6ms 0ms 4ms 12ms 16ms 8ms 9ms
Variation average: 8ms
```

```
Service instance: 4
MEP ID: 1023
Send 1DM total number: 77
Received 1DM total number: 0
```

**Table 14 Command output**

Field	Description
Service instance	Service instance of the MEP
Send 1DM total number	Number of 1DM frames sent
Received 1DM total number	Number of 1DM frames received
Delay average	Average frame delay
Delay variation	Frame delay variation
Variation average	Average frame delay variation

## display cfd linktrace-reply

### Syntax

```
display cfd linktrace-reply [ service-instance instance-id [ mep mep-id ] ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**mep** *mep-id*: Specifies the ID of a MEP, ranging from 1 to 8191.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd linktrace-reply** to display the LTR information received by a MEP.

If no MEP is specified, this command displays LTR information for all MEPs in the current service instance.

If no service instance is specified, this command displays LTR information for all MEPs.

## Examples

# Display LTR information saved on all the MEPs in every service instance when the standard version (IEEE 802.1ag) of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version standard
[Sysname] display cfd linktrace-reply
Service instance: 1      MEP ID: 1003
MAC Address              TTL      Last MAC              Relay Action
0000-FC00-6505          63      0000-FC00-6504      MPDB
000F-E269-A852          62      0000-FC00-6505      FDB
0000-FC00-6508          61      000F-E269-A852      Hit
Service instance: 2      MEP ID: 1023
MAC Address              TTL      Last MAC              Relay Action
0000-FC00-6508          61      000F-E269-A852      Hit
```

# Display the LTR information saved on all the MEPs in every service instance when the IEEE 802.1ag draft5.2 version of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version draft5
[Sysname] display cfd linktrace-reply
Service instance: 1      MEP ID: 1003
MAC Address              TTL      Forwarded              Relay Action
00E0-FC27-6502          63      Yes                    Found
00E0-FC00-6510          62      Yes                    Found
00E0-FC52-BAA0          61      No                     None
Service instance: 2      MEP ID: 1023
MAC Address              TTL      Forwarded              Relay Action
00E0-FC27-6502          63      No                     None
```

# Display the LTR information saved on all the MEPs in every service instance when the IEEE 802.1ag draft5.2 interim version of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version draft5-plus
[Sysname] display cfd linktrace-reply
Service instance: 1      MEP ID: 1003
MAC Address              TTL      Forwarded              Relay Action
00E0-FC27-6502          63      Yes                    Found
00E0-FC00-6510          62      Yes                    Found
00E0-FC52-BAA0          61      No                     None
Service instance: 2      MEP ID: 1023
MAC Address              TTL      Forwarded              Relay Action
00E0-FC27-6502          63      No                     None
```

---

### NOTE:

The output varies by CFD protocol version.

---

**Table 15 Command output**

Field	Description
Service instance	Service instance to which the MEPs that send LTMs belong.
MEP ID	ID of the MEP that sends LTMs.
MAC Address	Source MAC address in the LTR message.
TTL	Hop count when LTM passes the device.
Last MAC	MAC address of the last-hop device the LTM passes.
Forwarded	Indicates whether the device forwards LTMs: <ul style="list-style-type: none"> <li>• Yes means that the device has forwarded the LTMs.</li> <li>• No means that the device did not forward the LTMs.</li> </ul>
Relay Action	Indicates whether the forwarding device found the destination MAC address in its MAC address table. When the standard version (IEEE 802.1ag) of CFD is used: <ul style="list-style-type: none"> <li>• <b>Hit</b>—Indicates that the current device is the destination device.</li> <li>• <b>FDB</b>—Indicates that the forwarding device found the destination MAC address.</li> <li>• <b>MPDB</b>—Indicates that the destination MAC address is not found, or that the destination MAC address is found in the MEP or MIP database.</li> </ul> When the IEEE 802.1ag draft5.2 version or the IEEE 802.1ag draft5.2 interim version of CFD is used: <ul style="list-style-type: none"> <li>• <b>Found</b>—Indicates that the forwarding device found the destination MAC address in its MAC address table.</li> <li>• <b>Unknown</b>—Indicates that the forwarding device failed to find the destination MAC address in its MAC address table.</li> <li>• <b>None</b>—Indicates that it is a MEP that responded to the LTM message. A MEP does not need to find the destination MAC address.</li> </ul>

## display cfd linktrace-reply auto-detection

### Syntax

```
display cfd linktrace-reply auto-detection [ size size-value ] [ | { begin | exclude | include }
regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

**size** size-value: Specifies the times of recent auto-detections, ranging from 1 to 100.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd linktrace-reply auto-detection** to display the content of the LTR messages received as responses to the automatically sent LTRs.

These LTR messages received as responses to automatically sent LTRs are stored in the buffer after you executed the **cfd linktrace auto-detection** command.

If no size is specified, this command displays information about all LTRs stored in the buffer.

Related commands: **cfd linktrace auto-detection**.

## Examples

# Display the contents of the LTRs received as responses to the LTRs automatically sent when the standard version (IEEE 802.1ag) of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version standard
[Sysname] display cfd linktrace-reply auto-detection
Service instance: 1      MEP ID: 1003      Time: 2013/05/22 10:43:57
Target MEP ID: 2005      TTL: 64
MAC Address              TTL      Last MAC          Relay Action
0000-FC00-6505          63      0000-FC00-6504    MPDB
000F-E269-A852          62      0000-FC00-6505    FDB
0000-FC00-6508          61      000F-E269-A852    Hit
Service instance: 2      MEP ID: 1023      Time: 2013/05/22 10:44:06
Target MEP ID: 2025      TTL: 64
MAC Address              TTL      Last MAC          Relay Action
0000-FC00-6508          61      000F-E269-A852    Hit
```

# Display the contents of the LTRs received as responses to the LTRs automatically sent when the IEEE 802.1ag draft5.2 version of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version draft5
[Sysname] display cfd linktrace-reply auto-detection
Service instance: 1      MEP ID: 1003      Time: 2013/05/22 10:43:57
Target MEP ID: 2005      TTL: 64
MAC Address              TTL      Forwarded          Relay Action
00E0-FC27-6502          63      Yes                Found
00E0-FC00-6510          62      Yes                Found
00E0-FC52-BAA0          61      No                 None
Service instance: 2      MEP ID: 1023      Time: 2013/05/22 10:44:06
Target MEP ID: 2025      TTL: 64
MAC Address              TTL      Forwarded          Relay Action
00E0-FC27-6502          63      No                 None
```

# Display the contents of the LTRs received as responses to the LTRs automatically sent when the IEEE 802.1ag draft5.2 interim version of CFD is used.

```
<Sysname> system-view
[Sysname] cfd version draft5-plus
[Sysname] display cfd linktrace-reply auto-detection
Service instance: 1      MEP ID: 1003      Time: 2013/05/22 10:43:57
```

```

Target MEP ID: 2005      TTL: 64
MAC Address              TTL    Forwarded    Relay Action
00E0-FC27-6502          63     Yes          Found
00E0-FC00-6510          62     Yes          Found
00E0-FC52-BAA0          61     No           None

Service instance: 2      MEP ID: 1023    Time: 2013/05/22 10:44:06
Target MEP ID: 2025      TTL: 64
MAC Address              TTL    Forwarded    Relay Action
00E0-FC27-6502          63     No           None

```

**NOTE:**

The output varies by CFD protocol version.

**Table 16 Command output**

Field	Description
Service instance	Service instance to which the MEPs that sent LTM messages belong.
MEP ID	ID of the MEP that sends LTMs.
Time	Time of the LTMs automatically sent.
Target MEP ID	ID of the target MEP.
TTL	Initial hop count of the automatically sent LTMs.
MAC Address	Source MAC address in the LTR messages.
TTL	Hop count when LTM passes the device.
Last MAC	MAC address of the last-hop device the LTM passes.
Forwarded	Indicates whether the device forwards LTMs: <ul style="list-style-type: none"> <li>• Yes means that the device has forwarded the LTMs.</li> <li>• No means that the device did not forward the LTMs.</li> </ul>
Relay Action	Indicates whether the forwarding device found the destination MAC address in its MAC address table. When the standard version (IEEE 802.1ag) of CFD is used: <ul style="list-style-type: none"> <li>• <b>Hit</b>—Indicates that the current device is the destination device.</li> <li>• <b>FDB</b>—Indicates that the forwarding device found the destination MAC address.</li> <li>• <b>MPDB</b>—Indicates that the destination MAC address is not found, or that the destination MAC address is found in the MEP or MIP database.</li> </ul> When the IEEE 802.1ag draft5.2 version or the IEEE 802.1ag draft5.2 interim version of CFD is used: <ul style="list-style-type: none"> <li>• <b>Found</b>—Indicates that the forwarding device found the destination MAC address.</li> <li>• <b>Unknown</b>—Indicates that the forwarding device failed to find the destination MAC address.</li> <li>• <b>None</b>—Indicates that it is a MEP that responded to the LTM message. A MEP does not need to find the destination MAC address.</li> </ul>

# display cfd ma

## Syntax

```
display cfd ma [ [ ma-name ] md { md-name | level level-value } ] [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

*ma-name*: Name of MA, a character string of 1 to 43 characters. IEEE 802.1ag standard version allows an MA name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MA name to contain letters, numbers, and special characters (including – and \_), but do not allow an MA name to start or end with a special character.

*md-name*: Name of an MD, a character string of 1 to 43 characters. IEEE 802.1ag standard version allows an MD name to contain letters, numbers, and special characters (including ~ ! @ # \$ % ^ & \* ( ) - \_ + = { } [ ] | \ : ; " ' < > , . /). IEEE 802.1ag draft5.2 version and IEEE 802.1ag draft5.2 interim version allow an MD name to contain letters, numbers, and special characters (including – and \_), but do not allow an MD name to start or end with a special character.

**level** *level-value*: MD level, which ranges from 0 to 7.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd ma** to display the configuration of a specified MA.

If MD is not specified, this command displays the MA configurations of all MDs on the device.

If both MD and MA are specified, this command displays the specified MA configuration.

If only MD is specified, this command displays the configurations of all MAs in that MD.

If an MD does not have a name, you can specify it only by the MD level.

## Examples

```
# Display the MA configuration information in all MDs.
```

```
<Sysname> display cfd ma
3 maintenance domain(s) configured.
Maintenance domain: mdtest_5
1 maintenance association(s) belong(s) to this maintenance domain:
Maintenance association: matest_5
Service instance: 5          VLAN: 5          Level: 5
```

```

Maintenance domain: mdtest_6
1 maintenance association(s) belong(s) to this maintenance domain:
Maintenance association: matest_6
Service instance: 6          VLAN: 6          Level: 6

Maintenance domain: (Without Name)
1 maintenance association(s) belong(s) to this maintenance domain:
Maintenance association: matest_7
Service instance: 7          VLAN: 7          Level: 7

```

**Table 17 Command output**

Field	Description
3 maintenance domain(s) configured.	Number of MDs configured.
Maintenance domain	Name of the MD. (If the MD does not have a name, this field is displayed as <b>Without Name.</b> )
Level	MD level.
1 maintenance association(s) belong(s) to this maintenance domain	Number of MAs configured in the MD.
Maintenance association	Name of the MA.
Service instance	Service instance of the MA.
VLAN	VLAN to which the service instance belongs.
Level	Level of the MD to which the MA belongs.

## display cfd md

### Syntax

```
display cfd md [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd md** to display the MD configuration information.

## Examples

```
# Display the MD configuration information.
<Sysname> display cfd md
CFD is enabled.
8 maintenance domain(s) configured:
Level: 0      Maintenance domain: mdtest_0
Level: 1      Maintenance domain: mdtest_1
Level: 2      Maintenance domain: mdtest_2
Level: 3      Maintenance domain: mdtest_3
Level: 4      Maintenance domain: mdtest_4
Level: 5      Maintenance domain: mdtest_5
Level: 6      Maintenance domain: mdtest_6
Level: 7      Maintenance domain: (Without Name)
```

**Table 18 Command output**

Field	Description
8 maintenance domain(s) configured	Number of MDs configured.
Level	Level of MD. Each level allows only one MD.
Maintenance domain	Name of MD. (If the MD does not have a name, this field is displayed as <b>Without Name</b> .)

## display cfd mep

### Syntax

```
display cfd mep mep-id service-instance instance-id [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

**mep** *mep-id*: Specifies a MEP by its ID, ranging from 1 to 8191.

**service-instance** *instance-id*: Specifies a service instance by its ID, ranging from 1 to 32767.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd mep** to display the attribute and operating information of a MEP.

## Examples

```
# Display the attribute and operating information of MEP 50 in service instance 1.
```

```
<Sysname> display cfd mep 50 service-instance 1
Interface: GigabitEthernet1/0/2
Maintenance domain: mdtest_1
Maintenance association: matest_1
Level: 1          VLAN: 1          Direction: Outbound
Administrative state: Active          CCM send: Enable
FNG state: FNG_DEFECT_REPORTED

CCM:
Current state: CCI_WAITING
Interval: 1s          SendCCM: 12018

Loopback:
NextSeqNumber: 8877
SendLBR: 0          ReceiveInOrderLBR: 0          ReceiveOutOrderLBR: 0

Linktrace:
NextSeqNumber: 8877
SendLTR: 0          ReceiveLTM: 0

No CCM from some remote MEPS is received.
```

```
One or more streams of error CCMS is received. The last-received CCM:
Maintenance domain: (Without Name)
Maintenance association:matest1
MEP:5          Sequence Number:0x50A
Received Time: 13/3/6 13:01:34
```

```
One or more streams of cross-connect CCMS is received. The last-received CCM:
Maintenance domain:mdtest1
Maintenance association:matest1
MEP:6          Sequence Number:0x63A
Received Time: 13/3/6 13:01:34
```

```
Some other MEPS are transmitting the RDI bit.
```

**Table 19 Command output**

Field	Description
Interface	Interface that an MD belongs to.
Maintenance domain	MD that a MEP belongs to. (If the MD does not have a name, this field is displayed as <b>Without Name</b> .)
Maintenance association	MA to which a MEP belongs.
Level	Level of the MD.
VLAN	VLAN to which the MA belongs.

Field	Description
Direction	Direction of the MEPs.
Administrative state	State of MEP, either Active or Inactive.
CCM send	Whether the MEP sends CCM.
FNG state	State of FNG (Fault Notification Generator): <ul style="list-style-type: none"> <li>• FNG_RESET</li> <li>• FNG_DEFECT</li> <li>• FNG_REPORT_DEFECT</li> <li>• FNG_DEFECT_REPORTED</li> <li>• FNG_DEFECT_CLEARING</li> </ul> A hyphen (-) means not supported.
CCM	Information related to CCM.
Current state	State of CCMs sent: <ul style="list-style-type: none"> <li>• CCI_IDLE</li> <li>• CCI_WAITING</li> </ul> A hyphen (-) means not supported.
Interval	Interval to send CCM.
SendCCM	Number of CCMs that have been sent by the MEPs. A hyphen (-) means not supported.
Loopback	Information related to Loopback.
NextSeqNumber	Sequence number of the next LBM to be sent.
SendLBR	Number of LBRs that have been sent. If the MEP is inward-facing, the number of LBRs will not be counted.
ReceiveInOrderLBR	Number of LBR messages received in correct sequence.
ReceiveOutOrderLBR	Number of LBR messages received out of order.
Linktrace	Information related to linktrace.
NextSeqNumber	Sequence number of the next LTM to be sent.
SendLTR	Number of LTRs sent. If the MEP is inward-facing, the number of LTRs will not be counted.
ReceiveLTM	Number of LTMs received.
No CCM from some remote MEPs is received.	Failure to receive CCMs from some remote MEPs (This information is displayed only when some CCMs are lost.)
One or more streams of error CCMs is received. The last-received CCM:	Display the content of the last error CCM when one or more error CCMs are received. (This information is displayed only when error CCMs are received.)
Maintenance domain	MD of the last error CCM message. A hyphen (-) means not supported.
Maintenance association	MA of the last error CCM message. A hyphen (-) means not supported.
MEP	ID of the MEP that sent the last error CCM message. A hyphen (-) means not supported.

Field	Description
Sequence Number	Sequence number of the last error CCM. A hyphen (-) means not supported.
Received Time	Time when the last error CCM is received.
One or more streams of cross-connect CCMs is received. The last-received CCM:	Cross-connect CCMs are received, and the content of the last cross-connect CCM is displayed. (This information is displayed only when cross-connect CCMs are received.)
Some other MEPs are transmitting the RDI bit.	CCMs with the RDI flag bits set are received from other MEPs. (This information is displayed only when this type of CCMs are received.)

## display cfd meplist

### Syntax

```
display cfd meplist [ service-instance instance-id ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, ranging from 1 to 32767.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd meplist** to display the MEP list in a service instance.

If the service instance ID is not specified, this command displays MEP lists in all service instances.

### Examples

```
# Display the MEP list in service instance 5.
<Sysname> display cfd meplist service-instance 5
Service instance: 5
MEP list: 1 to 20, 30, 50.
```

## display cfd mp

### Syntax

```
display cfd mp [ interface interface-type interface-number ] [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

**interface** *interface-type interface-number*: Displays MP information for the port specified by its port type and port number.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd mp** to display MP information.

If no port is specified, this command displays the MP information on all ports.

The output is arranged by port name, then in the ascending VLAN ID order on the same port, and in the order of outward-facing MEPs (from low to high level), MIPs, and inward-facing MEPs (from high to low level) within the same VLAN.

## Examples

# Display the MP information on all ports.

```
<Sysname> display cfd mp
Interface GigabitEthernet1/0/1   VLAN 100
MEP ID: 100      Level: 0      Service instance: 100      Direction: Outbound
Maintenance domain: mdtest0
Maintenance association: mainmd0

MEP ID: 105      Level: 5      Service instance: 105      Direction: Outbound
Maintenance domain: mdtest5
Maintenance association: mainmd5

MIP              Level: 6      Service instance: 106
Maintenance domain: mdtest6
Maintenance association: mainmd6

MEP ID: 104      Level: 4      Service instance: 104      Direction: Inbound
Maintenance domain: mdtest4
Maintenance association: mainmd4

MEP ID: 102      Level: 2      Service instance: 102      Direction: Inbound
Maintenance domain: mdtest2
Maintenance association: mainmd2
```

```

Interface GigabitEthernet1/0/4   VLAN 1
MEP ID: 9           Level: 6     Service instance: 6     Direction: Outbound
Maintenance domain: mdtest6
Maintenance association: matest6

```

**Table 20 Command output**

Field	Description
Interface GigabitEthernet1/0/1 VLAN 100	MP configuration of the specified VLAN on the specified port
MEP ID	ID of the MEP
MIP	A MIP in the MP
Level	MD level that an MP belongs to
Service instance	Service instance to which the MP belongs
Direction	Direction of the MEP
Maintenance domain	MD to which an MP belongs
Maintenance association	MA to which an MP belongs

## display cfd remote-mep

### Syntax

```

display cfd remote-mep service-instance instance-id mep mep-id [ | { begin | exclude | include }
regular-expression ]

```

### View

Any view

### Default level

1: Monitor level

### Parameters

**service-instance** *instance-id*: Specifies the service instance ID, ranging from 1 to 32767.

**mep** *mep-id*: Specifies the ID of a remote MEP, ranging from 1 to 8191.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display cfd remote-mep** to display information about a remote MEP.

### Examples

```

# Display information about remote MEP 10 in service instance 4.
<sysname> display cfd remote-mep service-instance 4 mep 10

```

MEP ID	MAC Address	State	Time	MAC Status
20	00E0-FC00-6565	OK	2013/03/06 02:36:38	UP
30	00E0-FC27-6502	OK	2013/03/06 02:36:38	DOWN
40	00E0-FC00-6510	FAILED	2013/03/06 02:36:39	DOWN
50	00E0-FC52-BAA0	OK	2013/03/06 02:36:44	DOWN
60	0010-FC00-6502	OK	2013/03/06 02:36:42	DOWN

**Table 21 Command output**

Field	Description
MEP ID	ID of the remote MED.
MAC Address	MAC address of the remote MEP device. A hyphen (-) means not supported.
State	Running state of the remote MEP, which can be OK or FAILED.
Time	Time when the remote MEP entered the FAILED or OK state for the last time.
MAC Status	<p>State of the port indicated by the last CCM received from the remote MEP:</p> <ul style="list-style-type: none"> <li>• <b>UP</b>—The interface is ready to pass packets.</li> <li>• <b>DOWN</b>—The interface cannot pass packets.</li> <li>• <b>TESTING</b>—The interface is in some test mode.</li> <li>• <b>UNKNOWN</b>—The interface status cannot be determined for some reason.</li> <li>• <b>DORMANT</b>—The interface is not in a state to pass packets but is in a pending state, waiting for some external event.</li> <li>• <b>NOT-PRESENT</b>—Some component of the interface is missing.</li> <li>• <b>LLD</b>—The interface is down because of the state of the lower layer interfaces.</li> </ul> <p>A hyphen (-) means not supported.</p>

## display cfd service-instance

### Syntax

```
display cfd service-instance [ instance-id ] [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

*instance-id*: Service instance ID, ranging from 1 to 32767.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd service-instance** to display the configuration information of a service instance.

Without specifying the service instance ID, the command will display the configuration information of all service instances.

## Examples

# Display the configuration information of all service instances.

```
<Sysname> display cfd service-instance
2 service instance(s) configured:
Service instance 5:
Maintenance domain: mdtest_5
Maintenance association: matest_5
Level: 5          VLAN: 5          MIP rule: None          CCM interval: 1s

Service instance 6:
Maintenance domain: mdtest_6
Maintenance association: matest_6
Level: 6          VLAN: 6          MIP rule: None          CCM interval: 1s
MEP ID: 730       Interface: GigabitEthernet1/0/1  Direction: Inbound

Service instance 6:
Maintenance domain: (Without Name)
Maintenance association: matest_6
Level: 6          VLAN: 6          MIP rule: None          CCM interval: 1s
MEP ID: 731       Interface: GigabitEthernet1/0/2  Direction: Outbound
```

**Table 22 Command output**

Field	Description
2 service instance(s) are configured.	Number of service instance configured.
Service instance 5	Service instance ID.
Maintenance domain	MD of the service instance. (If the MD does not have a name, this field is displayed as <b>Without Name.</b> )
Maintenance association:	MA of the service instances.
Level	MD level.
VLAN	VLAN that the MA belongs to.
MIP rule	MIP generation rules configured on service instance.
CCM interval	Interval to send CCMs.
MEP ID	ID of MEPs configured on the service instance.
Interface	Interface of the MEP configured on the service instance.
Direction	Direction of the MEPs configured on the service instance.

# display cfd status

## Syntax

```
display cfd status [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd status** to display the status of CFD and AIS (enabled or disabled).

## Examples

```
# Display the status of CFD and AIS.  
<Sysname> display cfd status  
CFD is enabled.  
AIS is disabled.
```

# display cfd tst

## Syntax

```
display cfd tst [ service-instance instance-id [ mep mep-id ] ] [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the MEP by its ID, which ranges from 1 to 8191.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include:** Displays all lines that match the specified regular expression.

*regular-expression:* Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd tst** to display the TST result on the specified MEP.

If no MEP is specified, the **display cfd tst** command displays the TST results of all MEPs in the specified service instance.

If no service instance is specified, the **display cfd tst** command displays the TST results of all MEPs in all service instances.

Related commands: **cfd tst**.

## Examples

# Display the TST results of all the MEPs in all service instances.

```
<Sysname> display cfd tst
Service instance: 1
MEP ID: 1003
Send TST total number: 0
Received TST total number: 5
Received from 0010-FC00-6510, sequence number 1: Bit True
Received from 0010-FC00-6510, sequence number 2: Bit True
Received from 0010-FC00-6510, sequence number 3: Bit True
Received from 0010-FC00-6510, sequence number 4: Bit True
Received from 0010-FC00-6510, sequence number 5: Bit True
MEP ID: 1004
Send TST total number: 5
Received TST total number: 0

Service instance: 2
No mep exists in the service instance.

Service instance: 3
MEP ID: 1023
Send TST total number: 5
Received TST total number: 0
```

**Table 23 Command output**

Field	Description
Service instance	Service instance of the MEP.
Send TST total number	Number of TST frames sent.
Received TST total number	Number of TST frames received.
Received from 0010-FC00-6510, sequence number 01	TST frame with sequence number 01 received from the MEP with MAC address 0010-FC00-6510: <ul style="list-style-type: none"><li>• <b>Bit True</b>—No bit error occurred.</li><li>• <b>Bit False</b>—Bit errors occurred.</li></ul>

# display cfd version

## Syntax

**display cfd version** [ | { **begin** | **exclude** | **include** } *regular-expression* ]

## View

Any view

## Default level

1: Monitor level

## Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display cfd version** to display the CFD protocol version.

## Examples

```
# Display the CFD protocol version.
<Sysname> display cfd version
The current CFD version is standard.
```

**Table 24 Command output**

Field	Description
The current CFD version is draft5	Indicates that the current CFD protocol is IEEE 802.1ag draft5.2
The current CFD version is draft5-plus	Indicates that the current CFD protocol is the IEEE 802.1ag draft5.2 interim version
The current CFD version is standard	Indicates that the current CFD protocol is the standard version of IEEE 802.1ag

# reset cfd dm one-way history

## Syntax

**reset cfd dm one-way history** [ **service-instance** *instance-id* [ **mep** *mep-id* ] ]

## View

User view

## Default level

1: Monitor level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the MEP by its ID, which ranges from 1 to 8191.

## Description

Use **reset cfd dm one-way history** to clear the one-way DM result on the specified MEP.

If no MEP is specified, the **reset cfd dm one-way history** command clears the one-way DM results of all MEPs in the specified service instance.

If no service instance is specified, the **reset cfd dm one-way history** command clears the one-way DM results of all MEPs in all service instances.

Related commands: **display cfd dm one-way history**.

## Examples

```
# Clear the one-way DM results of all the MEPs in all service instances.
```

```
<Sysname> reset cfd dm one-way history
```

# reset cfd tst

## Syntax

```
reset cfd tst [ service-instance instance-id [ mep mep-id ] ]
```

## View

User view

## Default level

1: Monitor level

## Parameters

**service-instance** *instance-id*: Specifies a service instance by its ID, which ranges from 1 to 32767.

**mep** *mep-id*: Specifies the MEP by its ID, which ranges from 1 to 8191.

## Description

Use **reset cfd tst** to clear the TST result on the specified MEP.

If no MEP is specified, the **reset cfd tst** command clear the TST results of all MEPs in the specified service instance.

If no service instance is specified, the **reset cfd tst** command clears the TST results of all MEPs in all service instances.

Related commands: **display cfd tst**.

## Examples

```
# Clear the TST results of all the MEPs in all service instances.
```

```
<Sysname> reset cfd tst
```

---

# DLDP configuration commands

## display dldp

### Syntax

```
display dldp [ interface-type interface-number ] [ [ { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

*interface-type interface-number*: Specifies a port by its type and number.

*|*: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display dldp** to display the DLDP configuration of a port.

If no port is specified, this command displays the DLDP configuration of all DLDP-enabled ports.

### Examples

# Display the DLDP configuration of all the DLDP-enabled ports.

```
<Sysname> display dldp
DLDP global status : enable
DLDP interval : 5s
DLDP work-mode : enhance
DLDP authentication-mode : simple, password is *****
DLDP unidirectional-shutdown : auto
DLDP delaydown-timer : 2s
The number of enabled ports is 2.
```

```
Interface GigabitEthernet1/0/49
DLDP port state : advertisement
DLDP link state : up
The neighbor number of the port is 1 (the maximum number ever detected is 2).
    Neighbor mac address : 0000-0000-0100
    Neighbor port index : 79
    Neighbor state : two way
```

```
Neighbor aged time : 13
```

```
Interface GigabitEthernet1/0/50
DLDP port state : advertisement
DLDP link state : up
The neighbor number of the port is 1.
    Neighbor mac address : 0000-0000-1100
    Neighbor port index : 81
    Neighbor state : two way
    Neighbor aged time : 12
```

# Display the DLDP configuration of GigabitEthernet 1/0/49.

```
<Sysname> display dldp gigabitethernet 1/0/49
Interface GigabitEthernet1/0/49
DLDP port state : advertisement
DLDP link state : up
The neighbor number of the port is 1.
    Neighbor mac address : 0000-0000-0100
    Neighbor port index : 79
    Neighbor state : two way
    Neighbor aged time : 13
```

**Table 25 Command output**

Field	Description
DLDP global status	Global DLDP state (enable or disable).
DLDP interval	Interval for sending Advertisement packets (in seconds) to maintain neighbor relations.
DLDP work-mode	DLDP mode (enhance or normal).
DLDP authentication-mode	DLDP authentication mode (none, simple, or md5).
password	Password for DLDP authentication, which is displayed as asterisks (*****).
DLDP unidirectional-shutdown	Port shutdown mode (auto or manual) after unidirectional links are detected.
DLDP delaydown-timer	Setting of the DelayDown timer.
The number of enabled ports	Number of the DLDP-enabled ports.
Interface	Index of a DLDP-enabled port.
DLDP port state	DLDP state on a port: <ul style="list-style-type: none"><li>• initial</li><li>• inactive</li><li>• active</li><li>• advertisement</li><li>• probe</li><li>• disable</li><li>• <b>disable (loopback)</b>—The port is in disable state because it has received loopback packets.</li><li>• delaydown</li></ul>

Field	Description
DLDP link state	Port state (up or down).
The neighbor number of the port	Current number of neighbors.
the maximum number ever detected is 2	Maximum number of neighbors once detected on the port. This field appears only when the current number of neighbors is different from the maximum number of neighbors once detected.
Neighbor mac address	MAC address of the neighbor.
Neighbor port index	Neighbor port index.
Neighbor state	Neighbor state (unknown, one way, or two way).
Neighbor aged time	Neighbor aging time.

## display dldp statistics

### Syntax

```
display dldp statistics [ interface-type interface-number ] [ | { begin | exclude | include }
regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

*interface-type interface-number*: Specifies a port by its type and number.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display dldp statistics** to display DLDP packet statistics passing through a port.

If no port is specified, this command displays DLDP packet statistics passing through all the DLDP-enabled ports.

### Examples

```
# Display DLDP packet statistics passing through all the DLDP-enabled ports.
```

```
<Sysname> display dldp statistics
Interface GigabitEthernet1/0/49
  Packets sent : 6
  Packets received : 5
  Invalid packets received : 2
  Loop packets received : 0
```

```
Authentication failed packets received : 0
Valid packets received : 3
```

```
Interface GigabitEthernet1/0/50
Packets sent : 7
Packets received : 7
Invalid packets received : 3
Loop packets received : 0
Authentication failed packets received : 0
Valid packets received : 4
```

# Display DLDAP packet statistics passing through GigabitEthernet 1/0/49.

```
<Sysname> display dldap statistics gigabitethernet 1/0/49
Interface GigabitEthernet1/0/49
Packets sent : 6
Packets received : 5
Invalid packets received : 2
Loop packets received : 0
Authentication failed packets received : 0
Valid packets received : 3
```

**Table 26 Command output**

Field	Description
Interface	Port index
Packets sent	Total number of DLDAP packets sent
Packets received	Total number of DLDAP packets received
Invalid packets received	Number of the invalid packets received
Loop packets received	Number of the loopback packets received
Authentication failed packets received	Number of the received packets that failed to pass the authentication
Valid packets received	Number of the valid packets received

## dldap authentication-mode

### Syntax

```
dldap authentication-mode { none | { md5 | simple } password }
undo dldap authentication-mode
```

### View

System view

### Default level

2: System level

### Parameters

**none**: Specifies not to perform authentication.

**md5**: Specifies the MD5 authentication mode and sets a plaintext or ciphertext password.

**simple:** Specifies the simple authentication mode and sets a plaintext or ciphertext password.

*password:* Sets the password. This argument is case sensitive. It must be a plaintext string of 1 to 16 characters, or a ciphertext string of 33 to 53 characters.

## Description

Use **lldp authentication-mode** to configure DLDAP authentication.

Use **undo lldp authentication-mode** to restore the default.

By default, DLDAP authentication is not performed.

To enable DLDAP to operate properly, make sure the DLDAP authentication modes and the passwords configured on the two ends of a link are the same.

For secrecy, all DLDAP authentication passwords, including passwords configured in plain text, are saved in cipher text.

## Examples

# Configure the simple authentication mode and set the plaintext password to **abc** (assuming that Device A and Device B are connected by a DLDAP link).

- Configure Device A

```
<DeviceA> system-view
[DeviceA] dldp authentication-mode simple abc
```
- Configure Device B

```
<DeviceB> system-view
[DeviceB] dldp authentication-mode simple abc
```

# dldap delaydown-timer

## Syntax

**dldap delaydown-timer** *time*

**undo dldap delaydown-timer**

## View

System view

## Default level

2: System level

## Parameters

*time:* Sets the DelayDown timer, in the range of 1 to 5 seconds.

## Description

Use **dldap delaydown-timer** to set the DelayDown timer.

Use **undo dldap delaydown-timer** to restore the default.

By default, the setting of the DelayDown timer is 1 second.

The DelayDown timer configured by using this command applies to all DLDAP-enabled ports.

## Examples

# Set the DelayDown timer to 2 seconds.

```
<Sysname> system-view
```

```
[Sysname] dldp delaydown-timer 2
```

## dldp enable

### Syntax

**dldp enable**

**undo dldp enable**

### View

System view, Layer 2 Ethernet interface view, port group view

### Default level

2: System level

### Parameters

None

### Description

Use **dldp enable** to enable DLDP.

Use **undo dldp enable** to disable DLDP.

By default, DLDP is disabled both globally and on each port.

When executed in system view, this command takes effect globally. When executed in Layer 2 Ethernet interface view, this command takes effect on the current port. When executed in port group view, this command takes effect on all the ports in the port group.

DLDP can take effect only after you enable it globally and then on a port.

### Examples

# Enable DLDP globally, and then enable DLDP on GigabitEthernet 1/0/49.

```
<Sysname> system-view
[Sysname] dldp enable
[Sysname] interface gigabitethernet 1/0/49
[Sysname-GigabitEthernet1/0/49] dldp enable
```

# Enable DLDP globally, and then enable DLDP for all the ports in port group 1.

```
<Sysname> system-view
[Sysname] dldp enable
[Sysname] port-group manual 1
[Sysname-port-group-manual-1] group-member gigabitethernet 1/0/49 to gigabitethernet
1/0/50
[Sysname-port-group-manual-1] dldp enable
```

## dldp interval

### Syntax

**dldp interval** *time*

**undo dldp interval**

### View

System view

## Default level

2: System level

## Parameters

*time*: Sets the interval for sending Advertisement packets, in the range of 1 to 100 seconds.

## Description

Use **dldp interval** to set the interval for sending Advertisement packets.

Use **undo dldp interval** to restore the default.

By default, the interval for sending Advertisement packets is five seconds.

This command applies to all DLDAP-enabled ports.

## Examples

```
# Set the interval for sending Advertisement packets to 20 seconds.
```

```
<Sysname> system-view  
[Sysname] dldp interval 20
```

# dldp reset

## Syntax

**dldp reset**

## View

System view, Layer 2 Ethernet interface view, port group view

## Default level

2: System level

## Parameters

None

## Description

Use **dldp reset** to reset the DLDAP state for ports, enabling DLDAP down ports to perform unidirectional link detection.

When executed in system view, this command applies to all ports of the device. When executed in Layer 2 Ethernet interface view, this command applies to the current port. When executed in port group view, this command applies to all ports in the port group.

Related commands: **dldp enable** and **dldp unidirectional-shutdown**.

## Examples

```
# Reset DLDAP state for all ports.
```

```
<Sysname> system-view  
[Sysname] dldp reset
```

```
# Reset DLDAP state for port GigabitEthernet 1/0/49.
```

```
<Sysname> system-view  
[Sysname] interface gigabitethernet 1/0/49  
[Sysname-GigabitEthernet1/0/49] dldp reset
```

```
# Reset DLDAP state for all ports in port group 1.
```

```
<Sysname> system-view
[Sysname] port-group manual 1
[Sysname-port-group-manual-1] group-member gigabitethernet 1/0/49 to gigabitethernet
1/0/50
[Sysname-port-group-manual-1] dldp reset
```

## dldp unidirectional-shutdown

### Syntax

```
dldp unidirectional-shutdown { auto | manual }
undo dldp unidirectional-shutdown
```

### View

System view

### Default level

2: System level

### Parameters

**auto**: Configures the port shutdown mode as auto mode, where, when a unidirectional link is detected, the port involved is shut down by DLDP.

**manual**: Configures the port shutdown mode as manual mode, where, when a unidirectional link is detected, DLDP generates log and traps to prompt you to shut down the involved port instead of doing so automatically.

### Description

Use **dldp unidirectional-shutdown** to set the port shutdown mode.

Use **undo dldp unidirectional-shutdown** to restore the default.

By default, the port shutdown mode is auto mode.

Related commands: **dldp work-mode**.

### Examples

```
# Set the port shutdown mode to auto mode.
<Sysname> system-view
[Sysname] dldp unidirectional-shutdown auto
```

## dldp work-mode

### Syntax

```
dldp work-mode { enhance | normal }
undo dldp work-mode
```

### View

System view

### Default level

2: System level

## Parameters

**enhance**: Specifies the enhanced DLDAP mode.

**normal**: Specifies the normal DLDAP mode.

## Description

Use **dldap work-mode** to set the DLDAP mode.

Use **undo dldap work-mode** to restore the default DLDAP mode.

By default, a device operates in normal DLDAP mode.

## Examples

```
# Configure the device to operate in enhanced DLDAP mode.
<Sysname> system-view
[Sysname] dldap work-mode enhance
```

# reset dldap statistics

## Syntax

```
reset dldap statistics [ interface-type interface-number ]
```

## View

User view

## Default level

1: Monitor level

## Parameters

*interface-type interface-number*: Specifies a port by its type and number.

## Description

Use **reset dldap statistics** to clear DLDAP packets statistics passing through a port.

If no port is specified, this command clears the DLDAP packet statistics passing through all the DLDAP-enabled ports.

## Examples

```
# Clear the statistics on the DLDAP packets passing through all the DLDAP-enabled ports.
<Sysname> reset dldap statistics
```

---

# RRPP configuration commands

## control-vlan

### Syntax

```
control-vlan vlan-id  
undo control-vlan
```

### View

RRPP domain view

### Default level

2: System level

### Parameters

*vlan-id*: ID of the primary control VLAN for the RRPP domain, which ranges from 2 to 4093. The specified VLAN must be a new one (not yet created).

### Description

Use **control-vlan** to configure the primary control VLAN for the current RRPP domain.

Use **undo control-vlan** to remove the control VLAN configurations for the current RRPP domain.

By default, no primary control VLAN exists in the RRPP domain.

When configuring control VLANs for an RRPP domain, you only need to configure the primary control VLAN. The system automatically configures the secondary control VLAN, and it uses the primary control VLAN ID plus 1 as the secondary control VLAN ID. For the control VLAN configuration to succeed, make sure the IDs of the two control VLANs are consecutive and have not been assigned yet.

To ensure proper forwarding of RRPPDUs, do not configure the default VLAN of a port accessing an RRPP ring as the control VLAN, or enable 802.1Q in 802.1Q (QinQ) or VLAN mapping on the control VLANs.

Before configuring RRPP rings for an RRPP domain, you can delete or modify the control VLANs configured for the RRPP domain. However, after configuring RRPP rings for an RRPP domain, you cannot delete or modify the control VLANs of the domain. You can only use the **undo control-vlan** command to delete a control VLAN.

Related commands: **rrpp domain**.

### Examples

```
# Configure VLAN 100 as the primary control VLAN of RRPP domain 1 (assume that VLAN 100 and  
VLAN 101 have not been created yet).
```

```
<Sysname> system-view  
[Sysname] rrpp domain 1  
[Sysname-rrpp-domain1] control-vlan 100
```

# display rrpp brief

## Syntax

```
display rrpp brief [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display rrpp brief** to display the brief RRPP information.

## Examples

```
# Display the brief RRPP information.
```

```
<Sysname> display rrpp brief
```

```
Flags for Node Mode :
```

```
M -- Master , T -- Transit , E -- Edge , A -- Assistant-Edge
```

```
RRPP Protocol Status: Enable
```

```
Number of RRPP Domains: 2
```

```
Domain ID      : 1
```

```
Control VLAN   : Major 5      Sub 6
```

```
Protected VLAN: Reference Instance 0 to 2, 4
```

```
Hello Timer    : 1 sec  Fail Timer : 3 sec
```

Ring ID	Ring Level	Node Mode	Primary/Common Port	Secondary/Edge Port	Enable Status
---------	------------	-----------	---------------------	---------------------	---------------

1	1	M	GE1/0/1	GE1/0/2	Yes
---	---	---	---------	---------	-----

```
Domain ID      : 2
```

```
Control VLAN   : Major 10     Sub 11
```

```
Hello Timer    : 1 sec  Fail Timer : 3 sec
```

```
Protected VLAN: Reference Instance 0 to 2, 4
```

Ring ID	Ring Level	Node Mode	Primary/Common Port	Secondary/Edge Port	Enable Status
---------	------------	-----------	---------------------	---------------------	---------------

1	0	T	GE1/0/3	GE1/0/4	Yes
---	---	---	---------	---------	-----

2	1	E	GE1/0/3	GE1/0/5	Yes
			GE1/0/4		

**Table 27 Command output**

Field	Description
Flags for Node Mode	RRPP node mode: <ul style="list-style-type: none"> <li>• M represents master node.</li> <li>• T represents transit node.</li> <li>• E represents edge node.</li> <li>• A represents assistant edge node.</li> </ul>
RRPP Protocol Status	RRPP protocol status: <ul style="list-style-type: none"> <li>• Enable (globally enabled).</li> <li>• Disable (globally disabled).</li> </ul>
Number of RRPP Domains	Number of RRPP domains configured.
Domain ID	RRPP domain ID.
Control VLAN	Control VLANs of the RRPP domain: Major and Sub.
Protected VLAN	List of VLANs protected by the RRPP domain. Multiple Spanning Tree Instances (MSTIs) are displayed here. To get the VLANs corresponding to these MSTIs, use the <b>display stp region-configuration</b> command.
Hello Timer	Hello Timer value in seconds.
Fail Timer	Fail Timer value in seconds.
Ring ID	RRPP ring ID.
Ring Level	RRPP ring level <ul style="list-style-type: none"> <li>• 0 representing primary ring.</li> <li>• 1 representing subring.</li> </ul>
Node Mode	Node mode.
Primary/Common Port	<ul style="list-style-type: none"> <li>• Primary port when the node mode is master node or transit node.</li> <li>• Common port when the node mode is edge node or assistant edge node.</li> <li>• A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.</li> </ul>
Secondary/Edge Port	<ul style="list-style-type: none"> <li>• Secondary port when the node mode is master node or transit node.</li> <li>• Edge port when the node mode is edge node or assistant edge node.</li> <li>• A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.</li> </ul>
Enable Status	RRPP ring status: <ul style="list-style-type: none"> <li>• Yes indicates enabled.</li> <li>• No indicates disabled.</li> </ul>

## display rrpp ring-group

### Syntax

```
display rrpp ring-group [ ring-group-id ] [ [ { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor Level

## Parameters

*ring-group-id*: RRPP ring group ID, which ranges from 1 to 8.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display rrpp ring-group** to display the RRPP ring group configuration.

If no ring group ID is specified, this command displays the configuration of all ring groups.

If an RRPP ring ID is specified, this command displays the configuration of the specified RRPP ring group on the current device.

For an edge node RRPP ring group, this command also displays the subring sending Edge-Hello packets.

Related commands: **domain ring**.

## Examples

```
# Display the configuration of all RRPP ring groups.
```

```
<Sysname> display rrpp ring-group
Ring Group 1:
domain 1 ring 1 to 3, 5
domain 2 ring 1 to 3, 5
domain 1 ring 1 is the sending ring
```

```
Ring Group 2:
domain 1 ring 4, 6 to 7
domain 2 ring 4, 6 to 7
```

**Table 28 Command output**

Field	Description
Ring Group 1	RRPP ring group 1.
domain 1 ring 1 to 3, 5	Subrings in the ring group, including rings 1, 2, 3, and 5 in RRPP domain 1.
domain 1 ring 1 is the sending ring	The sending ring of the ring group is ring 1 in RRPP domain 1.

# display rrpp statistics

## Syntax

```
display rrpp statistics domain domain-id [ ring ring-id ] [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

*domain-id*: RRPP domain ID, which ranges from 1 to 8.

*ring-id*: RRPP ring ID, which ranges from 1 to 64.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display rrpp statistics** to display RRPPDU statistics.

If an RRPP ring ID is specified, this command displays RRPPDU statistics for the specified RRPP ring in the specified RRPP domain. If not, this command displays RRPPDU statistics for all RRPP rings in the specified RRPP domain.

If a port belongs to more than one ring, this command collects and displays its RRPPDU statistics by ring.

When a ring transits from inactive to active, packet counting for the ring restarts.

Related commands: **reset rrpp statistics**.

## Examples

```
# Display the RRPPDU statistics for ring 1 in RRPP domain 1.
```

```
<Sysname> display rrpp statistics domain 1 ring 1
```

```
Ring ID      : 1
```

```
Ring Level   : 1
```

```
Node Mode    : Master
```

```
Active Status : Yes
```

```
Primary port : GE1/0/1
```

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total

```
-----
```

Send	16424	0	0	1	0	0	16425
Rcv	0	0	0	0	0	0	0

```
Secondary port: GE1/0/2
```

Packet	Link	Common	Complete	Edge	Major	Packet
--------	------	--------	----------	------	-------	--------

	Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	0	0	0	0	0	0	0
Rcv	16378	0	0	1	0	0	16379

# Display the RRPPDU statistics for all rings in RRPP domain 2.

<Sysname> display rrpp statistics domain 2

Ring ID : 1

Ring Level : 0

Node Mode : Master

Active Status : Yes

Primary port : GE1/0/3

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	16924	0	0	1	0	16925
Rcv	0	0	0	0	0	0

Secondary port: GE1/0/4

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	0	0	0	0	0	0
Rcv	16878	0	0	1	0	16879

Ring ID : 2

Ring Level : 1

Node Mode : Edge

Active Status : No

Common port : GE1/0/3

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	0	0	0	0	0	0
Rcv	0	0	0	0	0	0

Common port : GE1/0/4

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	0	0	0	0	0	0
Rcv	0	0	0	0	0	0

Edge port : GE1/0/5

Packet	Link	Common	Complete	Edge	Major	Packet
Direct Hello	Down	Flush FDB	Flush FDB	Hello	Fault	Total
Send	0	0	0	0	0	0
Rcv	0	0	0	0	0	0

**Table 29 Command output**

Field	Description
Ring ID	RRPP ring ID.
Ring Level	RRPP ring level: <ul style="list-style-type: none"> <li>• 0 for primary ring.</li> <li>• 1 for subring.</li> </ul>
Node Mode	Node mode: <ul style="list-style-type: none"> <li>• Master node.</li> <li>• Transit node.</li> <li>• Edge node.</li> <li>• Assistant edge node.</li> </ul>
Active Status	RRPP ring activation status: <ul style="list-style-type: none"> <li>• Yes for active.</li> <li>• No for inactive.</li> </ul>
Primary Port	The primary port field means the node mode is master node or transit node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Secondary Port	The secondary port field means the node mode is master node or transit node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Common Port	The common port field means the node mode is edge node or assistant edge node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Edge Port	The edge port field means the node mode is edge node or assistant edge node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Packet Direct	Packet transmission direction on the port: Send or Rcv.
Hello	Hello packet statistics received/sent on the port.
Link Down	Link-Down packet statistics received/sent on the port.
Common Flush FDB	Common-Flush-FDB packet statistics received/sent on the port.
Complete Flush FDB	Complete-Flush-FDB packet statistics received/sent on the port.
Edge Hello	Edge-Hello packet statistics received/sent on the port.
Major Fault	Major-Fault packet statistics received/sent on the port.
Packet Total	Total number of packets received/sent on the port. Here only Hello, Link-Down, Common-Flush-FDB, Complete-Flush-FDB, Edge-Hello, and Major-Fault packets of RRPP are counted.

## display rrpp verbose

### Syntax

```
display rrpp verbose domain domain-id [ ring ring-id ] [ | { begin | exclude | include }
regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

*domain-id*: RRPP domain ID, which ranges from 1 to 8.

*ring-id*: RRPP ring ID, which ranges from 1 to 64.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display rrpp verbose** to display detailed RRPP information.

If an RRPP ring ID is specified, this command displays the detailed information of the specified ring in the specified RRPP domain. Otherwise, this command displays the detailed information of all the rings in the specified RRPP domain.

## Examples

# Display the detailed information of ring 1 in RRPP domain 1.

```
<Sysname> display rrpp verbose domain 1 ring 1
Domain ID      : 1
Control VLAN   : Major 5      Sub 6
Protected VLAN: Reference Instance 0 to 2, 4
Hello Timer    : 1 sec  Fail Timer : 3 sec
Ring ID        : 1
Ring Level     : 1
Node Mode      : Master
Ring State     : Complete
Enable Status  : Yes      Active Status: Yes
Primary port   : GE1/0/1           Port status: UP
Secondary port : GE1/0/2           Port status: BLOCKED
```

# Display the detailed information of all the rings in RRPP domain 2.

```
<Sysname> display rrpp verbose domain 2
Domain ID      : 2
Control VLAN   : Major 10     Sub 11
Protected VLAN: Reference Instance 3, 5 to 7
Hello Timer    : 1 sec  Fail Timer : 3 sec

Ring ID        : 1
Ring Level     : 0
Node Mode      : Master
Ring State     : Complete
```

```

Enable Status : Yes      Active Status: Yes
Primary port  : GE1/0/4      Port status: UP
Secondary port: GE1/0/5      Port status: BLOCKED

Ring ID       : 2
Ring Level    : 1
Node Mode     : Edge
Ring State    : -
Enable Status : No      Active Status: No
Common port   : GE1/0/4      Port status: -
                GE1/0/5      Port status: -
Edge port     : GE1/0/3      Port status: -

```

**Table 30 Command output**

Field	Description
Domain ID	RRPP domain ID.
Control VLAN	Control VLANs of the RRPP domain: <ul style="list-style-type: none"> <li>• <b>Major</b>—Represents the primary control VLAN.</li> <li>• <b>Sub</b>—Represents the secondary control VLAN.</li> </ul>
Protected VLAN	List of VLANs protected by the RRPP domain. MSTIs are displayed here. To get the VLANs corresponding to these MSTIs, use the <b>display stp region-configuration</b> command.
Hello Timer	Hello Timer value in seconds.
Fail Timer	Fail Timer value in seconds.
Ring ID	RRPP ring ID.
Ring Level	RRPP ring level: <ul style="list-style-type: none"> <li>• 0 representing primary ring.</li> <li>• 1 representing subring.</li> </ul>
Node Mode	Node mode: <ul style="list-style-type: none"> <li>• Master node.</li> <li>• Transit node.</li> <li>• Edge node.</li> <li>• Assistant edge node.</li> </ul>
Ring State	RRPP ring state: <ul style="list-style-type: none"> <li>• <b>Complete</b>—The ring is healthy.</li> <li>• <b>Failed</b>—The ring is not closed.</li> </ul> <p>If the ring is not enabled on the device working as the master node or the device is not the master node of the ring, a hyphen (-) is displayed.</p>
Enable Status	RRPP ring enable status: <ul style="list-style-type: none"> <li>• Yes for enabled.</li> <li>• No for disabled.</li> </ul>

Field	Description
Active Status	RRPP ring activation status. An RRPP ring can be active only when the RRPP protocol and the RRPP ring are both enabled. You can also use this field to identify whether the RRPP protocol are enabled. Two statuses are available: <ul style="list-style-type: none"> <li>• Yes for active.</li> <li>• No for inactive.</li> </ul>
Primary Port	The primary port field means the node mode is master node or transit node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Secondary Port	The secondary port field means the node mode is master node or transit node. - appears when the port is not configured on the ring or the board to which the port belongs does not start.
Common Port	The common port field means the node mode is edge node or assistant edge node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Edge Port	The edge port field means the node mode is edge node or assistant edge node. A hyphen (-) appears when the port is not configured on the ring or the board to which the port belongs does not start.
Port status	Port status includes down, up and blocked; a hyphen (-) appears in one of the following cases: <ul style="list-style-type: none"> <li>• The ring is inactive.</li> <li>• The port is not configured on the ring.</li> <li>• The board to which the port belongs does not start.</li> </ul>

## domain ring

### Syntax

```
domain domain-id ring ring-id-list
undo domain domain-id [ring ring-id-list]
```

### View

RRPP ring group view

### Default level

2: System level

### Parameters

*domain-id*: RRPP domain ID, which ranges from 1 to 8.

*ring-id-list*: RRPP subring ID list expressed in the format of *ring-id-list*={ *ring-id* [ **to** *ring-id* ] }&<1-10>, where the *ring-id* argument is an RRPP subring ID in the range of 1 to 64 and &<1-10> indicates that you can input up to ten RRPP ring ID ranges.

### Description

Use **domain ring** to configure subrings for an RRPP ring group.

Use **undo domain ring** to remove the specified subrings from an RRPP ring group. If no subring ID list is specified, all subrings in the ring group are removed in the specified domain.

Follow these guidelines when configuring an RRPP ring group on the edge node and the assistant-edge node:

- When assigning an active ring to a ring group, do that on the assistant-edge node first and then on the edge node.
- To remove an active ring from a ring group, do that on the edge node first and then on the assistant-edge node.
- To remove the whole ring group, do that on the edge node first and then on the assistant-edge node.
- When activating rings in a ring group, do that on the edge node first and then on the assistant-edge node.
- When deactivating rings in a ring group, do that on the assistant-edge node first and then on the edge node.

Failure to follow these guidelines can cause the failure of assistant-edge node to receive Edge-Hello packets and mistakenly considering the primary ring as failed.

Related commands: **rrpp ring-group** and **display rrpp ring-group**.

## Examples

```
# Configure subrings for RRPP ring group 1.
<Sysname> system-view
[Sysname] rrpp ring-group 1
[Sysname-rrpp-ring-group1] domain 1 ring 1 to 3 5
[Sysname-rrpp-ring-group1] domain 2 ring 1 to 3 5
```

## protected-vlan

### Syntax

```
protected-vlan reference-instance instance-id-list
undo protected-vlan [ reference-instance instance-id-list ]
```

### View

RRPP domain view

### Default level

2: System level

### Parameters

**reference-instance** *instance-id-list*: Specifies the MSTIs you want to reference in the form of *instance-id-list* = { *instance-id* [ **to** *instance-id* ] } <1-10>. The *instance-id* argument is an MSTI ID that ranges from 0 to 32. *instance-id* 0 represents the common internal spanning tree (CIST). <1-10> means that you can specify up to 10 MSTI IDs or ID ranges. You can use the **display stp region-configuration** command to display the instance-to-VLAN mappings. (A device operating in PVST mode automatically maps VLANs to MSTIs.)

### Description

Use **protected-vlan** to configure the protected VLANs for the RRPP domain.

Use **undo protected-vlan** to remove the protected VLAN configuration of the RRPP domain.

By default, no protected VLAN is specified for an RRPP domain.

To be compatible with old-version RRPP, which does not support protected VLAN configuration, an RRPP domain protects all VLANs on a device started with an old-version configuration file.

If the **reference-instance** *instance-id-list* option is specified, the **undo protected-vlan** command removes configuration of VLANs mapped to the specified MSTIs. Otherwise, the command removes configuration of all protected VLANs.

You can delete or modify the protected VLANs configured for an RRPP domain before and after you configure rings for it. However, you cannot delete configuration of all protected VLANs configured for the domain.

When the VLAN-to-MSTI mappings change, the protected VLANs of an RRPP domain also changes according to the MSTIs configured for the domain.

Related commands: **rrpp domain**; **display stp region-configuration** (*Layer 2—LAN Switching Command Reference*).

## Examples

```
# Map VLANs 1 through 30 to MSTI 1, activate the MST region configuration, configure VLAN 100 as
the control VLAN of RRPP domain 1, and configure VLANs mapped to MSTI 1 as the protected VLANs
of RRPP domain 1.
```

```
<Sysname> system-view
[Sysname] stp region-configuration
[Sysname-mst-region] instance 1 vlan 1 to 30
[Sysname-mst-region] active region-configuration
[Sysname-mst-region] quit
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protected-vlan reference-instance 1
```

## reset rrpp statistics

### Syntax

```
reset rrpp statistics domain domain-id [ ring ring-id ]
```

### View

User view

### Default level

1: Monitor level

### Parameters

*domain-id*: RRPP domain ID, which ranges from 1 to 8.

*ring-id*: RRPP ring ID, which ranges from 1 to 64.

### Description

Use **reset rrpp statistics** to clear RRPPDU statistics.

If an RRPP ring ID is specified, this command clears the RRPPDU statistics for the specified RRPP ring in the specified RRPP domain. Otherwise, this command clears the RRPPDU statistics for all RRPP rings in the specified RRPP domain.

Related commands: **display rrpp statistics**.

## Examples

```
# Clear the RRPPDU statistics for ring 10 in RRPP domain 1.
<Sysname> reset rrpp statistics domain 1 ring 10
```

## ring

### Syntax

```
ring ring-id node-mode { { master | transit } [ primary-port interface-type interface-number ]
[ secondary-port interface-type interface-number ] level level-value | { edge | assistant-edge }
[ edge-port interface-type interface-number ] }
```

```
undo ring ring-id
```

### View

RRPP domain view

### Default level

2: System level

### Parameters

*ring-id*: RRPP ring ID, which ranges from 1 to 64.

**master**: Specifies the device as the master node of the RRPP ring.

**transit**: Specifies the device as the transit node of the RRPP ring.

**primary-port**: Specifies the port as a primary port.

*interface-type interface-number*: Specifies a port by its type and number. The port can be a Layer-2 Ethernet port or Layer-2 aggregate interface.

**secondary-port**: Specifies the port as a secondary port.

*level-value*: RRPP ring level, with 0 representing primary ring and 1 representing subring.

**edge**: Specifies the device as the edge node of the RRPP ring.

**assistant-edge**: Specifies the device as the assistant edge node of the RRPP ring.

**edge-port**: Specifies the edge port for the node.

### Description

Use **ring** to configure the node mode of the device, the role of the specified RRPP port, and the level of the RRPP ring.

Use **undo ring** to remove the configuration.

The ID of an RRPP ring in a domain must be unique.

When an RRPP is enabled, you cannot configure its RRPP ports.

When configuring the edge node and the assistant-edge node, first configure the primary ring, and then the subrings.

The node mode, RRPP port role, and ring level settings of an RRPP ring cannot be modified once they are configured. To modify the settings, first remove the present settings.

You must remove all subring configurations before deleting the primary ring configuration of the edge node or the assistant-edge node. However, an active RRPP ring cannot be deleted.

Related command: **ring enable**.

## Examples

# Specify the device as the master node of primary ring 10 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port.

```
<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 10 node-mode master primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 0
```

# Specify the device as the transit node of primary ring 10 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port.

```
<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 10 node-mode transit primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 0
```

# Specify the device as the master node of subring 20 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port.

```
<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 20 node-mode master primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 1
```

# Specify the device as the transit node of primary ring 20 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port.

```
<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 20 node-mode transit primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 1
```

# Specify the device as the transit node of primary ring 10 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port. Then, specify the device as the edge node of subring 20 in RRPP domain 1, GigabitEthernet 1/0/3 as the edge port.

```
<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 10 node-mode transit primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 0
[Sysname-rrpp-domain1] ring 20 node-mode edge edge-port gigabitethernet 1/0/3
```

# Specify the device as the transit node of primary ring 10 in RRPP domain 1, GigabitEthernet 1/0/1 as the primary port and GigabitEthernet 1/0/2 as the secondary port. Then, specify the device as the assistant edge node of subring 20 in RRPP domain 1, GigabitEthernet 1/0/3 as the edge port.

```

<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 10 node-mode transit primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 0
[Sysname-rrpp-domain1] ring 20 node-mode assistant-edge edge-port gigabitethernet 1/0/3

```

## ring enable

### Syntax

```

ring ring-id enable
undo ring ring-id enable

```

### View

RRPP domain view

### Default level

2: System level

### Parameters

*ring-id*: RRPP ring ID, which ranges from 1 to 64.

### Description

Use **ring enable** to enable the RRPP ring.

Use **undo ring enable** to disable the RRPP ring.

By default, the RRPP ring is disabled.

To activate the RRPP domain, enable the RRPP protocol and the RRPP rings for the RRPP domain.

Related commands: **rrpp enable**.

### Examples

# Enable RRPP ring 10 in RRPP domain 1.

```

<Sysname> system-view
[Sysname] rrpp domain 1
[Sysname-rrpp-domain1] control-vlan 100
[Sysname-rrpp-domain1] protect-vlan reference-instance 0 1 2
[Sysname-rrpp-domain1] ring 10 node-mode master primary-port gigabitethernet 1/0/1
secondary-port gigabitethernet 1/0/2 level 0
[Sysname-rrpp-domain1] ring 10 enable

```

## rrpp domain

### Syntax

```

rrpp domain domain-id
undo rrpp domain domain-id

```

### View

System view

## Default level

2: System level

## Parameters

*domain-id*: RRPP domain ID, which ranges from 1 to 8.

## Description

Use **rrpp domain** to create an RRPP domain and enter its view.

Use **undo rrpp domain** to remove an RRPP domain.

Deleting an RRPP domain also removes the configurations of the control VLANs and protected VLANs.

To delete an RRPP domain successfully, make sure it has no RRPP rings.

Related commands: **control-vlan** and **protected-vlan**.

## Examples

```
# Create RRPP domain 1, and enter RRPP domain 1 view.
```

```
<Sysname> system-view  
[Sysname] rrpp domain 1  
[Sysname-rrpp-domain1]
```

# rrpp enable

## Syntax

**rrpp enable**

**undo rrpp enable**

## View

System view

## Default level

2: System level

## Parameters

None

## Description

Use **rrpp enable** to enable RRPP protocol.

Use **undo rrpp enable** to disable RRPP protocol.

By default, RRPP protocol is disabled.

To activate the RRPP domain, enable the RRPP protocol and the RRPP rings for the RRPP domain.

Related commands: **ring enable**.

## Examples

```
# Enable the RRPP protocol.
```

```
<Sysname> system-view  
[Sysname] rrpp enable
```

# rrpp ring-group

## Syntax

```
rrpp ring-group ring-group-id  
undo rrpp ring-group ring-group-id
```

## View

System view

## Default level

2: System level

## Parameters

*ring-group-id*: RRPP ring group ID, which ranges from 1 to 8.

## Description

Use **rrpp ring-group** to create an RRPP ring group and enter RRPP ring group view.

Use **undo rrpp ring-group** to delete an RRPP ring group.

RRPP configured with ring groups cannot interoperate with RRPP that does not support ring group configuration.

When removing a ring group, do that on the edge node first and then on the assistant-edge node. If you fail to follow the order, the assistant-edge node may fail to receive Edge-Hello packets and mistakenly considers that the primary ring has failed.

After a ring group is removed, all subrings in the ring group do not belong to any ring group.

Related commands: **domain ring** and **display rrpp ring-group**.

## Examples

```
# Create RRPP ring group 1 and enter its view.  
<Sysname> system-view  
[Sysname] rrpp ring-group 1  
[Sysname-rrpp-ring-group1]
```

# timer

## Syntax

```
timer hello-timer hello-value fail-timer fail-value  
undo timer
```

## View

RRPP domain view

## Default level

2: System level

## Parameters

*hello-value*: Hello timer value, which ranges from 1 to 10 seconds.

*fail-value*: Fail timer value, which ranges from 3 to 30 seconds.

## Description

Use **timer** to configure the Hello timer value and the Fail timer value for the RRPP domain.

Use **undo timer** to restore it to the default value.

By default, the Hello timer value is 1 second and the Fail timer value is 3 seconds.

The Fail timer value must be greater than or equal to three times the Hello timer value.

## Examples

# Set the Hello timer value to 2 seconds and the Fail timer value to 7 seconds.

```
<Sysname> system-view
```

```
[Sysname] rrpp domain 1
```

```
[Sysname-rrpp-domain1] timer hello-timer 2 fail-timer 7
```

# Smart Link configuration commands

## display smart-link flush

### Syntax

```
display smart-link flush [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display smart-link flush** to display information about received flush messages.

### Examples

```
# Display information about received flush messages.
```

```
<Sysname> display smart-link flush
Received flush packets                : 10
Receiving interface of the last flush packet : GigabitEthernet1/0/1
Receiving time of the last flush packet   : 19:19:03 2013/04/21
Device ID of the last flush packet       : 000f-e200-8500
Control VLAN of the last flush packet    : 1
```

**Table 31 Command output**

Field	Description
Received flush packets	Total number of received flush messages
Receiving interface of the last flush packet	Port that received the last flush message
Receiving time of the last flush packet	Time when the last flush message was received
Device ID of the last flush packet	Device ID carried in the last flush message
Control VLAN of the last flush packet	Control VLAN ID carried in the last flush message

# display smart-link group

## Syntax

```
display smart-link group { group-id | all } [ | { begin | exclude | include } regular-expression ]
```

## View

Any view

## Default level

1: Monitor level

## Parameters

*group-id*: Smart link group ID, which ranges from 1 to 26.

**all**: Displays information about all smart link groups.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

## Description

Use **display smart-link group** to display information about the specified or all smart link groups.

## Examples

```
# Display information about smart link group 1.
```

```
<Sysname> display smart-link group 1
Smart link group 1 information:
Device ID: 000f-e200-8500
Preemption mode: ROLE
Preemption delay: 1(s)
Control VLAN: 1
Protected VLAN: Reference Instance 0 to 2, 4
Member                Role    State    Flush-count  Last-flush-time
-----
GigabitEthernet1/0/1  MASTER  ACTVIE   1            16:37:20 2013/04/21
GigabitEthernet1/0/2  SLAVE   STANDBY  2            17:45:20 2013/04/21
```

**Table 32 Command output**

Field	Description
Smart link group 1 information	Information about smart link group 1.
Preemption mode	Preemption mode, which can be <b>role</b> for preemption enabled or <b>none</b> for preemption disabled.
Preemption delay	Preemption delay time, in seconds.
Control-VLAN	Control VLAN ID.

Field	Description
Protected VLAN	Protected VLANs of the smart link group. Referenced Multiple Spanning Tree Instances (MSTIs) are displayed here. To view the VLANs mapped to the referenced MSTIs, use the <b>display stp region-configuration</b> command.
Member	Member port of the smart link group.
Role	Port role: master or slave.
State	Port state: active, standby, or down.
Flush-count	Number of transmitted flush messages.
Last-flush-time	Time when the last flush message was transmitted. (NA indicates that no flush message has been transmitted.)

## flush enable

### Syntax

**flush enable** [ **control-vlan** *vlan-id* ]

**undo flush enable**

### View

Smart link group view

### Default level

2: System level

### Parameters

**control-vlan** *vlan-id*: Specifies the control VLAN used for transmitting flush messages. The *vlan-id* argument represents the control VLAN ID, which ranges from 1 to 4094.

### Description

Use **flush enable** to enable flush update.

Use **undo flush enable** to disable flush update.

By default, flush update is enabled for smart link groups and VLAN 1 is used for flush message transmission.

Configure different control VLANs for different smart link groups.

Related commands: **smart-link flush enable**.

### Examples

```
# Disable flush update for smart link group 1.
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] undo flush enable
```

## port

### Syntax

**port** *interface-type interface-number* { **master** | **slave** }

**undo port** *interface-type interface-number*

## View

Smart link group view

## Default level

2: System level

## Parameters

*interface-type interface-number*: Specifies a port by its type and number.

**master**: Specifies a port as the master port.

**slave**: Specifies a port as the slave port.

## Description

Use **port** to configure the specified port as the master or slave port of the current smart link group.

Use **undo port** to remove the specified port from the smart link group.

Disable the spanning tree feature and RRPP on the ports you want to add to the smart link group, and make sure the ports are not member ports of any aggregation group. On the other hand, you cannot enable the spanning tree feature or RRPP on a smart link group member port or assign a smart link group member port to an aggregation group.

You can assign a port to a smart link group with the **port smart-link group** command in Layer 2 Ethernet interface view or Layer 2 aggregate interface view.

Related commands: **port smart-link group**.

## Examples

# Configure GigabitEthernet 1/0/1 as the slave port of smart link group 1.

```
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] undo stp enable
[Sysname-GigabitEthernet1/0/1] quit
[Sysname] smart-link group 1
[Sysname-smlk-group1] protected-vlan reference-instance 0
[Sysname-smlk-group1] port gigabitethernet 1/0/1 slave
```

# port smart-link group

## Syntax

**port smart-link group** *group-id* { **master** | **slave** }

**undo port smart-link group** *group-id*

## View

Layer 2 Ethernet interface view, Layer 2 aggregate interface view

## Default level

2: System level

## Parameters

*group-id*: Smart link group ID, which ranges from 1 to 26.

**master:** Specifies the port as the master port.

**slave:** Specifies the port as the slave port.

## Description

Use **port smart-link group** to configure the current port as a member of the specified smart link group.

Use **undo port smart-link group** to remove the port from the specified smart link group.

Disable the spanning tree feature and RRPP on the ports you want to add to the smart link group, and make sure the ports are not member ports of any aggregation group. On the other hand, you cannot enable the spanning tree feature or RRPP on a smart link group member port or assign a smart link group member port to an aggregation group.

You can assign a port to a smart link group with the port command in smart link group view.

Related commands: **port**.

## Examples

```
# Configure GigabitEthernet 1/0/1 as the master port of smart link group 1.
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] protected-vlan reference-instance 0
[Sysname-smlk-group1] quit
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] undo stp enable
[Sysname-GigabitEthernet1/0/1] port smart-link group 1 master

# Configure Layer 2 aggregate interface 1 as the master port of smart link group 1.
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] protected-vlan reference-instance 0
[Sysname-smlk-group1] quit
[Sysname] interface bridge-aggregation 1
[Sysname-Bridge-Aggregation1] undo stp enable
[Sysname-Bridge-Aggregation1] port smart-link group 1 master
```

# port smart-link group track

## Syntax

**port smart-link group** *group-id* **track cfd cc**

**undo port smart-link group** *group-id* **track cfd cc**

## View

Layer 2 Ethernet interface view

## Default level

2: System level

## Parameters

*group-id*: Number of a smart link group, which ranges from 1 to 26.

## Description

Use **port smart-link group track** to configure the collaboration between a smart link group member port and the CC function of CFD.

Use **undo port smart-link group track** to remove the collaboration.

By default, smart link group member ports do not collaborate with the CC function of CFD.

Before configuring the collaboration between a port and the CC function of CFD, make sure the port is already a member port of a smart link group.

The control VLAN of the smart link group to which the port belongs must match the detection VLAN of the CC function of CFD.

## Examples

# Configure the collaboration between GigabitEthernet 1/0/1, the master port of smart link group 1, and the CC function of CFD to detect the link status.

```
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] protected-vlan reference-instance 0
[Sysname-smlk-group1] quit
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] undo stp enable
[Sysname-GigabitEthernet1/0/1] port smart-link group 1 master
[Sysname-GigabitEthernet1/0/1] port smart-link group 1 track cfd cc
```

# preemption delay

## Syntax

**preemption delay** *delay-time*

**undo preemption delay**

## View

Smart link group view

## Default level

2: System level

## Parameters

*delay-time*: Preemption delay (in seconds), in the range of 0 to 300.

## Description

Use **preemption delay** to set the preemption delay. When role preemption is enabled, after the preemption delay is set, the master port waits for a specific period before taking over to collaborate with the switchover of upstream devices.

Use **undo preemption delay** to restore the default.

By default, the preemption delay is 1 second.

The preemption delay configuration takes effect only after role preemption is enabled.

Related commands: **preemption mode**.

## Examples

```
# Enable role preemption and set the preemption delay to 10 seconds.
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] preemption mode role
[Sysname-smlk-group1] preemption delay 10
```

# preemption mode

## Syntax

**preemption mode role**

**undo preemption mode**

## View

Smart link group view

## Default level

2: System level

## Parameters

**role**: Configures the role preemption mode, which enables the master port to preempt the slave port in active state.

## Description

Use **preemption mode** to enable role preemption.

Use **undo preemption mode** to disable role preemption.

By default, the device is operating in non-preemption mode.

## Examples

```
# Enable the role preemption mode.
<Sysname> system-view
[Sysname] smart-link group 1
[Sysname-smlk-group1] preemption mode role
```

# protected-vlan

## Syntax

**protected-vlan reference-instance** *instance-id-list*

**undo protected-vlan** [ **reference-instance** *instance-id-list* ]

## View

Smart link group view

## Default level

2: System level

## Parameters

**reference-instance** *instance-id-list*: Specifies the MSTIs you want to reference in the form of *instance-id-list* = { *instance-id* [ **to** *instance-id* ] }&<1-10>. The *instance-id* argument is an MSTI ID that ranges from 0 to

32. A value of 0 represents the common internal spanning tree (CIST). `<1-10>` means that you can specify up to 10 MSTI IDs or ID ranges. You can use the **display stp region-configuration** command to display the instance-to-VLAN mappings. (A device operating in PVST mode automatically maps VLANs to MSTIs.)

## Description

Use **protected-vlan** to configure protected VLANs for a smart link group.

Use **undo protected-vlan** to remove the protected VLAN configuration of the smart link group.

By default, no protected VLAN is configured for a smart link group.

If the **reference-instance** *instance-id-list* option is specified, the **undo protected-vlan** command removes configuration of VLANs mapped to the specified MSTIs. Otherwise, the command removes configuration of all protected VLANs.

Before you assign ports to a smart link group, configure protected VLANs for the smart link group.

You can remove the protected VLAN configuration of a smart link group when the group is empty but not after a member port is assigned to it.

Removing a smart link group also removes its protected VLAN configuration.

If the VLANs mapped to a referenced MSTI change, the protected VLANs also change.

Configure the VLANs to which the member ports of a smart link group belong as the protected VLANs of the smart link group.

Related commands: **smart-link group**; **display stp region-configuration** (*Layer 2—LAN Switching Command Reference*).

## Examples

# Map VLANs 1 through 30 to MSTI 1, activate the MST region configuration, and configure the VLANs mapped to MSTI 1 as the protected VLANs of smart link group 1.

```
<Sysname> system-view
[Sysname] stp region-configuration
[Sysname-mst-region] instance 1 vlan 1 to 30
[Sysname-mst-region] active region-configuration
[Sysname-mst-region] quit
[Sysname] smart-link group 1
[Sysname-smlk-group1] protected-vlan reference-instance 1
```

## reset smart-link statistics

### Syntax

**reset smart-link statistics**

### View

User view

### Default level

2: System level

### Parameters

None

## Description

Use **reset smart-link statistics** to clear flush message statistics.

## Examples

```
# Clear flush message statistics.
<Sysname> reset smart-link statistics
```

# smart-link flush enable

## Syntax

```
smart-link flush enable [ control-vlan vlan-id-list ]
undo smart-link flush enable [ control-vlan vlan-id-list ]
```

## View

Layer 2 Ethernet interface view, Layer 2 aggregate interface view

## Default level

2: System level

## Parameters

**control-vlan** *vlan-id-list*: Specifies the control VLANs used for receiving flush messages. The *vlan-id-list* is expressed in the form of *vlan-id-list* = { *vlan-id* [ **to** *vlan-id* ] }&<1-10>, where the *vlan-id* argument represents the ID of a control VLAN and ranges from 1 to 4094. &<1-10> indicates that you can provide up to ten VLAN IDs or VLAN ID lists.

## Description

Use **smart-link flush enable** to configure a receive control VLAN—a VLAN for receiving flush messages.

Use **undo smart-link flush enable** to disable flush message processing.

By default, flush messages are not processed.

If no VLAN is specified, VLAN 1 applies.

Do not use this command on the member port of an aggregation group.

Related commands: **flush enable**.

## Examples

```
# Enable GigabitEthernet 1/0/1 to process the flush messages received in VLAN 1.
<Sysname> system-view
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] smart-link flush enable

# Enable Layer 2 aggregate interface 1 to process the flush messages received in VLAN 1.
<Sysname> system-view
[Sysname] interface bridge-aggregation 1
[Sysname-Bridge-Aggregation1] smart-link flush enable
```

# smart-link group

## Syntax

```
smart-link group group-id
```

**undo smart-link group** *group-id*

## View

System view

## Default level

2: System level

## Parameters

*group-id*: Smart link group ID, which ranges from 1 to 26.

## Description

Use **smart-link group** to create a smart link group and enter smart link group view.

Use **undo smart-link group** to remove a smart link group.

You cannot remove a smart link group with member ports.

## Examples

# Create smart link group 1 and enter smart link group view.

```
<Sysname> system-view  
[Sysname] smart-link group 1  
[Sysname-smk-group1]
```

# Monitor Link configuration commands

## display monitor-link group

### Syntax

```
display monitor-link group { group-id | all } [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

*group-id*: Monitor link group ID, which ranges from 1 to 16.

**all**: Displays information about all monitor link groups.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display monitor-link group** to display monitor link group information.

### Examples

```
# Display information about monitor link group 1.
```

```
<Sysname> display monitor-link group 1
Monitor link group 1 information:
Group status: DOWN
Last-up-time: 16:37:20 2013/4/21
Last-down-time: 16:38:26 2013/4/21
Member                Role      Status
-----
GigabitEthernet1/0/1  UPLINK   DOWN
GigabitEthernet1/0/2  DOWNLINK DOWN
```

**Table 33 Command output**

Field	Description
Monitor link group 1 information	Information about monitor link group 1
Group status	Monitor link group state, which can be up or down
Last-up-time	Last time when the monitor link group was up

Field	Description
Last-down-time	Last time when the monitor link group was down
Member	Member ports of the monitor link group
Role	Port role, which can be uplink port or downlink port
Status	Member link state, which can be up or down

## monitor-link group

### Syntax

```
monitor-link group group-id
undo monitor-link group group-id
```

### View

System view

### Default level

2: System level

### Parameters

*group-id*: Monitor link group ID, which ranges from 1 to 16.

### Description

Use **monitor-link group** to create a monitor link group and enter monitor link group view. If the specified monitor link group already exists, this command directly leads you to monitor link group view.

Use **undo monitor-link group** to remove a monitor link group.

Related commands: **port monitor-link group** and **port**.

### Examples

```
# Create monitor link group 1 and enter the view of monitor link group 1.
<Sysname> system-view
[Sysname] monitor-link group 1
[Sysname-mtlk-group1]
```

## port

### Syntax

```
port interface-type interface-number { uplink | downlink }
undo port interface-type interface-number
```

### View

Monitor link group view

### Default level

2: System level

### Parameters

*interface-type interface-number*: Specifies a port by type and number.

**uplink**: Specifies an uplink port.

**downlink**: Specifies a downlink port.

## Description

Use **port** to assign a port to the monitor link group.

Use **undo port** to remove a port from the monitor link group.

You can assign Layer 2 Ethernet ports or Layer 2 aggregate interfaces to a monitor link group as member ports.

A port can be assigned to only one monitor link group.

Alternatively, you can assign a port to a monitor link group by using the **port monitor-link group** command in Layer 2 Ethernet interface view or Layer 2 aggregate interface view.

Related commands: **port monitor-link group**.

## Examples

```
# Create monitor link group 1, and configure GigabitEthernet 1/0/1 as an uplink port and  
GigabitEthernet 1/0/2 as a downlink port for monitor link group 1.
```

```
<Sysname> system-view  
[Sysname] monitor-link group 1  
[Sysname-mtlk-group1] port gigabitethernet 1/0/1 uplink  
[Sysname-mtlk-group1] port gigabitethernet 1/0/2 downlink
```

# port monitor-link group

## Syntax

```
port monitor-link group group-id { uplink | downlink }
```

```
undo port monitor-link group group-id
```

## View

Layer 2 Ethernet interface view, Layer 2 aggregate interface view

## Default level

2: System level

## Parameters

*group-id*: Monitor link group ID, which ranges from 1 to 16.

**uplink**: Specifies an uplink port.

**downlink**: Specifies a downlink port.

## Description

Use **port monitor-link group** to assign the current port to a monitor link group as a member port.

Use **undo port monitor-link group** to remove the current port from a monitor link group.

A port can be assigned to only one monitor link group.

Alternatively, you can assign a port to a monitor link group with the **port** command in monitor link group view.

Related commands: **port**.

## Examples

# Create monitor link group 1, and configure GigabitEthernet 1/0/1 as an uplink port and GigabitEthernet 1/0/2 as a downlink port for monitor link group 1.

```
<Sysname> system-view
[Sysname] monitor-link group 1
[Sysname-mtlk-group1] quit
[Sysname] interface gigabitethernet 1/0/1
[Sysname-GigabitEthernet1/0/1] port monitor-link group 1 uplink
[Sysname-GigabitEthernet1/0/1] quit
[Sysname] interface gigabitethernet 1/0/2
[Sysname-GigabitEthernet1/0/2] port monitor-link group 1 downlink
```

---

# Track configuration commands

## display track

### Syntax

```
display track { track-entry-number | all } [ | { begin | exclude | include } regular-expression ]
```

### View

Any view

### Default level

1: Monitor level

### Parameters

*track-entry-number*: Displays information about the specified track entry, in the range of 1 to 1024.

**all**: Displays information about all the track entries.

|: Filters command output by specifying a regular expression. For more information about regular expressions, see *Fundamentals Configuration Guide*.

**begin**: Displays the first line that matches the specified regular expression and all lines that follow.

**exclude**: Displays all lines that do not match the specified regular expression.

**include**: Displays all lines that match the specified regular expression.

*regular-expression*: Specifies a regular expression, a case-sensitive string of 1 to 256 characters.

### Description

Use **display track** to display track entry information.

### Examples

```
# Display information about all track entries.
```

```
<Sysname> display track all
Track ID: 1
  Status: Positive (notify 13 seconds later)
  Duration: 0 days 0 hours 0 minutes 7 seconds
  Notification delay: Positive 20, Negative 30 (in seconds)
  Reference object:
    NQA entry: admin test
    Reaction: 10
Track ID: 2
  Status: Negative
  Duration: 0 days 0 hours 0 minutes 32 seconds
  Notification delay: Positive 20, Negative 30 (in seconds)
  Reference object:
    Track interface :
    Interface status : Inserted
    Interface       : Vlan-interface3
```

Table 34 Command output

Field	Description
Track ID	ID of a track entry.
Status	Status of a track entry: <ul style="list-style-type: none"> <li>• <b>Positive</b>—The tracked object functions properly.</li> <li>• <b>Invalid</b>—The tracked object is invalid.</li> <li>• <b>Negative</b>—The tracked object is abnormal.</li> </ul>
notify 13 seconds later	The track module notifies the application modules of the track entry state change 13 seconds later. The information is not displayed after the track module notifies the application modules.
Duration	Time period during which the track entry stays in the state.
Notification delay: Positive 20, Negative 30 (in seconds)	<ul style="list-style-type: none"> <li>• The track module notifies the application modules that the status of the track entry changes to Positive after a delay time of 20 seconds.</li> <li>• The track module notifies the application modules that the status of the track entry changes to Negative after a delay time of 30 seconds.</li> </ul>
Reference object	Tracked object associated with the track entry.
NQA entry	NQA test group associated with the track entry.
Reaction	Reaction entry associated with the track entry.
Track interface	Information of the interface associated with the track entry.
Interface status	Interface status: <ul style="list-style-type: none"> <li>• Inserted</li> <li>• Removed</li> </ul>
Interface	Interface to be monitored.
Protocol	Physical status or Layer 3 protocol status of the monitored interface: <ul style="list-style-type: none"> <li>• <b>None</b>—Physical status of the monitored interface.</li> <li>• <b>IPv4</b>—IPv4 protocol status of the monitored Layer 3 interface.</li> <li>• <b>IPv6</b>—IPv6 protocol status of the monitored Layer 3 interface.</li> </ul>

## track interface

### Syntax

```
track track-entry-number interface interface-type interface-number [ delay { negative negative-time | positive positive-time } * ]
```

```
undo track track-entry-number
```

### View

System view

### Default level

2: System level

### Parameters

*track-entry-number*: Specifies a track entry ID, in the range of 1 to 1024.

*interface-type interface-number*: Specifies an interface by its type and number.

**delay**: Specifies that the track module notifies the application modules of the track entry status change after a specific delay time. If this keyword is not provided, the track module notifies the application modules immediately when the track entry status changes.

**negative** *negative-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Negative. *negative-time* represents the delay time in seconds, in the range of 1 to 300.

**positive** *positive-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Positive. *positive-time* represents the delay time in seconds, in the range of 1 to 300.

## Description

Use **track interface** to create a track entry, associate it with the physical status of a specific interface, and specify the delay time for the track module to notify the application modules when the status of the track entry changes.

Use **undo track** to remove the track entry.

By default, no track entry to be associated with the physical status of a specific interface is created.

After a track entry is created, you cannot change its settings except the delay time. To change the delay time, use the **track interface delay** command. To modify other settings of this track entry, first delete the entire track entry, and then create a new track entry.

When a track entry to be associated with the physical status of a specific interface is created, the status of the track entry is Positive if the physical status of the interface is up. The status of the track entry is Negative if the physical status of the interface is down. To display the physical status of an interface, use the **display ip interface brief** command.

Related commands: **display track**; **display ip interface brief** (*Layer 3—IP Services Command Reference*).

## Examples

```
# Create track entry 1, and associate it with the physical status of interface GigabitEthernet 1/0/1.
<Sysname> system-view
[Sysname] track 1 interface gigabitethernet 1/0/1
```

# track interface protocol

## Syntax

```
track track-entry-number interface interface-type interface-number protocol { ipv4 | ipv6 } [ delay
{ negative negative-time | positive positive-time } * ]
```

```
undo track track-entry-number
```

## View

System view

## Default level

2: System level

## Parameters

*track-entry-number*: Specifies a track entry ID, in the range of 1 to 1024.

*interface-type interface-number*: Specifies an interface by its type and number.

**ipv4**: Monitors the IPv4 protocol status. When the IPv4 protocol status of an interface is up, the status of the track object is Positive. When the IPv4 protocol status of an interface is down, the status of the track object is Negative. To display the IPv4 protocol status of an interface, use the **display ip interface brief** command.

**ipv6**: Monitors the IPv6 protocol status. When the IPv6 protocol status of an interface is up, the status of the track object is Positive. When the IPv6 protocol status of an interface is down, the status of the track object is Negative. To display the IPv6 protocol status of an interface, use the **display ipv6 interface** command.

**delay**: Specifies that the track module notifies the application modules of the track entry status change after a specific delay time. If this keyword is not provided, the track module notifies the application modules immediately when the track entry status changes.

**negative** *negative-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Negative. *negative-time* represents the delay time in seconds, in the range of 1 to 300.

**positive** *positive-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Positive. *positive-time* represents the delay time in seconds, in the range of 1 to 300.

## Description

Use **track interface protocol** to create a track entry, associate it with the protocol status of a specific interface, and specify the delay time for the track module to notify the application modules when the status of the track entry changes.

Use **undo track** to remove the track entry.

By default, no track entry exists.

After a track entry is created, you cannot change its settings except the delay time. To change the delay time, use the **track interface protocol delay** command. To modify other settings of this track entry, first delete the entire track entry, and then create a new track entry.

Related commands: **display track**; **display ip interface brief** (*Layer 3—IP Services Command Reference*); **display ipv6 interface** (*Layer 3—IP Services Command Reference*).

## Examples

```
# Create track entry 1, and associate it with the IPv4 protocol status of VLAN-interface 2.
<Sysname> system-view
[Sysname] track 1 interface vlan-interface 2 protocol ipv4
```

## track nqa

### Syntax

**track** *track-entry-number* **nqa entry** *admin-name operation-tag reaction item-number* [ **delay** { **negative** *negative-time* | **positive** *positive-time* } \* ]

**undo track** *track-entry-number*

### View

System view

### Default level

2: System level

## Parameters

*track-entry-number*: Specifies a track entry ID, in the range of 1 to 1024.

**entry** *admin-name operation-tag*: Specifies the NQA test group to be associated with the track entry. *admin-name* is the name of the NQA test group administrator who creates the NQA operation, and is a case-insensitive string of 1 to 32 characters. *operation-tag* is the NQA operation tag, a case-insensitive string of 1 to 32 characters.

**reaction** *item-number*: Specifies the reaction entry to be associated with the track entry. *item-number* is the reaction entry ID, in the range of 1 to 10.

**delay**: Specifies that the track module notifies the application modules of the track entry status change after a specific delay time. If this keyword is not provided, the track module notifies the application modules immediately when the track entry status changes.

**negative** *negative-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Negative. *negative-time* represents the delay time in seconds, in the range of 1 to 300.

**positive** *positive-time*: Specifies the delay time for the track module to notify the application modules that the status of the track entry changes to Positive. *positive-time* represents the delay time in seconds, in the range of 1 to 300.

## Description

Use **track nqa** to create a track entry, associate it with the specified reaction entry of the NQA test group, and specify the delay time for the track module to notify the application modules when the status of the track entry changes.

Use **undo track** to remove the track entry.

By default, no track entry exists.

After a track entry is created, you cannot change its settings except the delay time. To change the delay time, use the **track nqa delay** command. To modify other settings of this track entry, first delete the entire track entry, and then create a new track entry.

Related commands: **display track; nqa** and **reaction** (*Network Management and Monitoring Command Reference*).

## Examples

```
# Create track entry 1, and associate it with reaction entry 3 of the NQA test group (admin-test).
```

```
<Sysname> system-view
```

```
[Sysname] track 1 nqa entry admin test reaction 3
```

---

# Support and other resources

## Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

## Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/wwalerts>

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

## Related information

### Documents

To find related documents, browse to the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

- For related documentation, navigate to the Networking section, and select a networking category.
- For a complete list of acronyms and their definitions, see *HP FlexNetwork Technology Acronyms*.

### Websites

- HP.com <http://www.hp.com>
- HP Networking <http://www.hp.com/go/networking>
- HP manuals <http://www.hp.com/support/manuals>
- HP download drivers and software <http://www.hp.com/support/downloads>
- HP software depot <http://www.software.hp.com>
- HP Education <http://www.hp.com/learn>

# Conventions

This section describes the conventions used in this documentation set.

## Command conventions

Convention	Description
<b>Boldface</b>	<b>Bold</b> text represents commands and keywords that you enter literally as shown.
<i>Italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[ ]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x   y   ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[ x   y   ... ]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x   y   ... } *	Asterisk-marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[ x   y   ... ] *	Asterisk-marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

## GUI conventions

Convention	Description
<b>Boldface</b>	Window names, button names, field names, and menu items are in bold text. For example, the <b>New User</b> window appears; click <b>OK</b> .
>	Multi-level menus are separated by angle brackets. For example, <b>File &gt; Create &gt; Folder</b> .

## Symbols

Convention	Description
 <b>WARNING</b>	An alert that calls attention to important information that if not understood or followed can result in personal injury.
 <b>CAUTION</b>	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
 <b>IMPORTANT</b>	An alert that calls attention to essential information.
<b>NOTE</b>	An alert that contains additional or supplementary information.
 <b>TIP</b>	An alert that provides helpful information.

## Network topology icons

---

	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
	Represents an access controller, a unified wired-WLAN module, or the switching engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a security product, such as a firewall, a UTM, or a load-balancing or security card that is installed in a device.
	Represents a security card, such as a firewall card, a load-balancing card, or a NetStream card.

---

## Port numbering in examples

The port numbers in this document are for illustration only and might be unavailable on your device.

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